NASA SP-7011 (173)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 173)

NOVEMBER 1977

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7011 (173)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 173)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in October 1977 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 233 reports, articles and other documents announced during October 1977 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1977 Supplements.

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TABLE OF CONTENTS

Page

IAA Entries (A77-10000)..... 261
STAR Entries (N77-10000)..... 277

Subject Index..... I-1
Personal Author Index..... I-23

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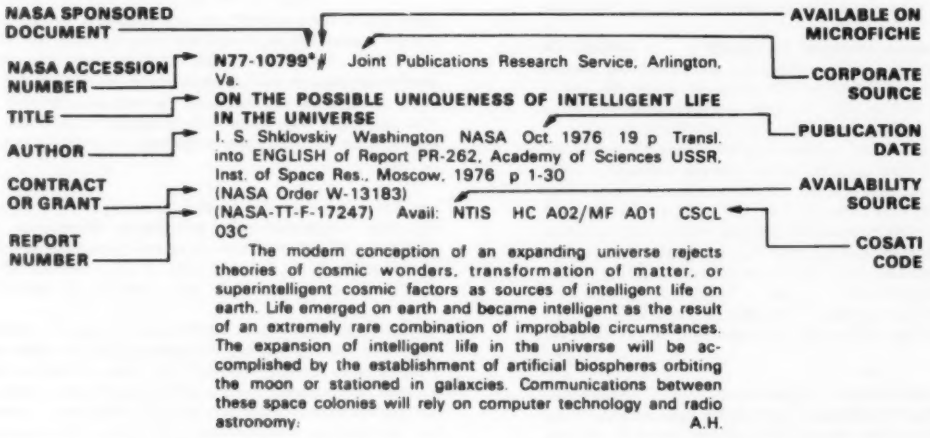
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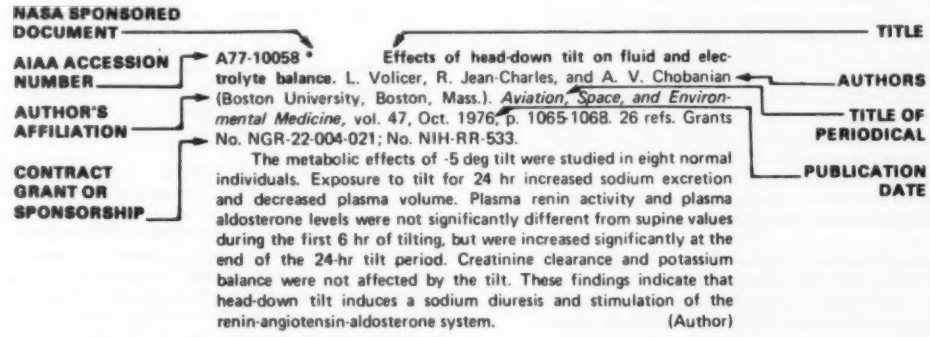
ON THE POSSIBLE UNIQUENESS OF INTELLIGENT LIFE IN THE UNIVERSE
I. S. Shklovskiy Washington NASA Oct. 1976 19 p Transl. into ENGLISH of Report PR-262, Academy of Sciences USSR, Inst. of Space Res., Moscow, 1976 p 1-30
(NASA Order W-13183)
(NASA-TT-F-17247) Avail: NTIS HC A02/MF A01 CSCL 03C
The modern conception of an expanding universe rejects theories of cosmic wonders, transformation of matter, or superintelligent cosmic factors as sources of intelligent life on earth. Life emerged on earth and became intelligent as the result of an extremely rare combination of improbable circumstances. The expansion of intelligent life in the universe will be accomplished by the establishment of artificial biospheres orbiting the moon or stationed in galaxies. Communications between these space colonies will rely on computer technology and radio astronomy. A.H.

TYPICAL CITATION AND ABSTRACT FROM *IAA*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A77-10058 * Effects of head-down tilt on fluid and electrolyte balance. L. Volicer, R. Jean-Charles, and A. V. Chobanian (Boston University, Boston, Mass.). Aviation, Space, and Environmental Medicine, vol. 47, Oct. 1976, p. 1065-1068. 26 refs. Grants No. NGR-22-004-021; No. NIH-RR-533.
The metabolic effects of -5 deg tilt were studied in eight normal individuals. Exposure to tilt for 24 hr increased sodium excretion and decreased plasma volume. Plasma renin activity and plasma aldosterone levels were not significantly different from supine values during the first 6 hr of tilting, but were increased significantly at the end of the 24-hr tilt period. Creatinine clearance and potassium balance were not affected by the tilt. These findings indicate that head-down tilt induces a sodium diuresis and stimulation of the renin-angiotensin-aldosterone system. (Author)

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 173)

NOVEMBER 1977

IAA ENTRIES

A77-40655 # Photo- and stereographic methods for studying the disk of the optic nerve (Foto- i stereofotograficheskaia metodiki izucheniia diska zritel'nogo nerva). E. A. Egorov. *Voenno-Meditsinskii Zhurnal,* May 1977, p. 46, 47. In Russian.

A method for photographing the fundus oculi is described. Photographs are obtained with the Opton fundus camera using a green annular filter with an overall diameter of 22 mm. The filter is placed outside the optical system of the camera to avoid disturbance of focus. Stereophotographs are obtained by means of an Allen stereoseparator. Characteristics of the fundus oculi in patients with neuritis, advanced glaucoma, and pigment dystrophy of the retina are compared. C.K.D.

A77-40656 # Functional shifts in parachute jumps by beginning and experienced parachutists (Funktsional'nye sdvigi pri pryzhkakh s parashiutom u opytnykh i nachinaiushchikh parashiutistov). S. A. Razumov, A. S. Chekirda, and A. S. Mozzhukhin. *Voenno-Meditsinskii Zhurnal,* May 1977, p. 56-61. 13 refs. In Russian.

Functional changes in the nervous system and cardio-vascular system of beginning and experienced parachutists on days when jumps were scheduled were investigated. A variety of parameters, including heart rate, arterial pressure, electrocardiograms, intensity of perspiration, and levels of stress hormones (catecholamines and dioxyphenylalanine) in the urine was measured on days with and without scheduled jumps. No significant changes in ECG were noted on jump days. However, increases in all other indicators studied were noted before jumps. Changes were more pronounced in inexperienced parachutists than in experienced parachutists, and were dependent to some extent on individual differences in the ability to cope with stress and on jump conditions (weather, altitude, etc.). C.K.D.

A77-40657 # The combined effect of ultrashort-wave irradiation and hyperoxia on animals (Kombinirovannoe deistvie SVCh izlucheniia i giperoksii na organizm zhivotnykh). A. P. Miasnikov and E. V. Lomovtsev. *Voenno-Meditsinskii Zhurnal,* May 1977, p. 61-65. In Russian.

The combined effect of ultrashort-wave radiation and hyperoxia was investigated in white mice and in male dogs with or without previous artificially induced myocardial infarct. In animals previously subjected to induced myocardial infarct and exposed over a period of time to microwave irradiation, an increase in the partial pressure of oxygen produced pronounced deterioration in heart function. Prolonged exposure to elevated oxygen partial pressure was found to have a cumulative effect; subsequent exposure to microwave irradiation was found to sharply increase sensitivity of test animals to hyperoxia. C.K.D.

A77-40658 # Psychological aspects of spatial orientation problems in pilots (Psikhologicheskii aspekt problemy prostranstvennoi orientirovki letchika). N. D. Zavalova and V. A. Ponomarenko. *Voenno-Meditsinskii Zhurnal,* May 1977, p. 70-74. 13 refs. In Russian.

Factors affecting the ability of a pilot to formulate a mental image of the position of his aircraft are discussed. The relationship between the task of piloting according to a set flight regime and the task of formulating a conception of the position of the aircraft at a given moment is discussed. The manner in which experienced pilots use control panel information in developing their mental image of the position of their aircraft is examined. Exercises for honing the ability of pilots to formulate a stable mental image of aircraft position under any set of flight conditions are suggested. C.K.D.

A77-40659 Effects of fatiguing isometric and isotonic exercise on resisted and unresisted reaction time components. A. F. Morris (Maryland, University, College Park, Md.). *European Journal of Applied Physiology,* vol. 37, no. 1, 1977, p. 1-11. 27 refs.

Fractionated resisted and unresisted simple reaction time (RT) for a knee-extension task was assessed on 12 male subjects over a 10-day treatment period. The first 4 days were baseline days and were designed to stabilize all RT values as well as strength measures. For the next 6 days the subjects were alternately administered isometric and isotonic exercise designed to fatigue the quadriceps musculature. Although significant strength decrements were manifested for both isometric exercise (57%) and isotonic exercise (35%), no changes were shown in the unresisted fractionated RT components. Conversely all resisted RT changes were manifested in the muscular component suggesting a peripheral site for neuromuscular fatigue. (Author)

A77-40660 Determination of pulse rate variations caused by a stimulus (Zur Ermittlung reizbedingter Pulsfrequenzänderungen). B. Griefahn (Institut für Arbeits- und Sozialmedizin, Mainz, West Germany). *European Journal of Applied Physiology,* vol. 37, no. 1, 1977, p. 13-16. 6 refs. In German.

Short acoustic stimuli produce pulse frequency changes. After an initial rise in the pulse frequency and following an abrupt pulse frequency decrease, the frequency rises again to its initial value. In studies conducted by Baust and Marbaise (1971) and Hord et al. (1966), the described pulse frequency characteristics were represented as a function of the number of the heart beat in the beat sequence. The maximum of the poststimulatory pulse frequency was found to occur at the fourth beat. Griefahn (1975) has developed an evaluation procedure in which the stimulus-produced pulse frequency changes are considered exclusively as a function of time. The relative merits of the new and conventional evaluation procedures are compared. It is found that for a suitable description of the pulse frequency changes an indication of the time cannot be replaced by an indication of the number of the beat as a variable. G.R.

A77-40661 A portable heart rate distribution recorder for studying daily physical activity. W. H. M. Saris, P. Snel, and R. A. Binkhorst (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands). *European Journal of Applied Physiology,* vol. 37, no. 1, 1977, p. 17-25. 10 refs.

A small, lightweight seven level heartbeat integrator using a two-electrode system has been developed and tested on adults and children. The device provides beat-to-beat monitoring of heart rates from 35 to 225 beats per minute. An eight-level quality register separates counts in the 225-300 hr range due to muscle noise and

other types of interference. Results obtained using this integrator compared well with those obtained with a manual acoustic monitoring system and a heart rate recording system. C.K.D.

A77-40662 Carbohydrate and fat metabolism of unacclimatized men during and after submaximal exercise in cool and hot environments. M. Irondelle and H. Freund (CNRS, Centre d'Etudes Bioclimatiques, Strasbourg, France). *European Journal of Applied Physiology*, vol. 37, no. 1, 1977, p. 27-38. 31 refs.

A77-40663 Exercise effects on the time of reactions to auditory stimuli. I. Szmodis (Central School of Sports, Budapest, Hungary). *European Journal of Applied Physiology*, vol. 37, no. 1, 1977, p. 39-46. 8 refs.

The reaction time to auditory stimuli of 61 highly-trained athletes was measured during steady-state and nonsteady-state exercise to exhaustion. As in studies with visual stimuli (Molomoski et al., 1969; Szmodis et al., 1969), reaction time was found to increase with increasing exercise load. The overall mean correlation between the latency of reaction to auditory stimuli and steady-state work output was 0.61; a correlation of 0.47 was found in the case of nonsteady-state exertion. There was a slight departure from linearity when subjects neared subjective exhaustion in both near-maximum or maximum steady-state work and in exhaustive nonsteady-state exercise. Results indicate that subjective work capacity rather than absolute work output is the determining factor in reaction time. C.K.D.

A77-40664 Validity and reliability of pedometers in habitual activity research. H. C. G. Kemper and R. Verschuur (Amsterdam, Universiteit, Amsterdam, Netherlands). *European Journal of Applied Physiology*, vol. 37, no. 1, 1977, p. 71-82. 12 refs.

The reliability of pedometer scores as indicators of the actual steprate in walking and running and as measures of oxygen intake was investigated. The effect of the position of the waist-suspended pedometers on their scores was studied. Actual steprate on a treadmill was measured and compared with pedometer scores; energy expenditure of the subjects was determined by measuring heart rate and oxygen intake. It was found that pedometers are an unreliable means of measuring steprate in walking at 2 and 4 km/hr (standard deviation - 34%); small deviations from actual steprate (1-10%) were found in walking at 6 km/hr and running. The reliability of oxygen intake levels determined from pedometer scores was found to increase with increasing speed. The position of the pedometer was found to have no significant effect on scores. C.K.D.

A77-40671 Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation. R. L. McGowan, N. D. Martin, B. L. Zaret, R. R. Hall, A. L. Bryson, H. W. Strauss, and M. D. Flamm (USAF, David Grant Medical Center, Travis AFB, Calif.). *American Journal of Cardiology*, vol. 40, July 1977, p. 6-10. 15 refs. USAF-supported research.

A total of 781 noninvasive myocardial imaging studies were performed at rest and with exercise in 345 patients using potassium-43 or rubidium-81, or both. Images were interpreted by three observers unaware of the clinical data. One hundred sixty patients underwent coronary angiography and were classified into those with coronary arterial obstruction of 70 per cent or greater (hemodynamically significant disease) or less than 70 per cent obstruction (insignificant disease) to investigate the sensitivity and specificity of noninvasive myocardial imaging. Fifty-one of the 62 patients with insignificant coronary artery disease has normal imaging studies (specificity 82 per cent). The 98 patients with significant coronary artery disease has 81 abnormal imaging studies (sensitivity 83 per cent). Excluding patients with myocardial infarction, the sensitivity rate of myocardial imaging was 75 per cent, whereas that of standard electrocardiographic exercise tolerance testing was 72 per cent. The sensitivity rate in identifying angiographic coronary stenosis in noninfarcted vascular beds was 88 per cent when results of myocardial imaging and electrocardiographic exercise testing were combined. (Author)

A77-40672 Echocardiographic diagnosis of left anterior descending coronary artery disease. C. D. Joffe, H. Brik, L. E. Teichholz, M. V. Herman, and R. Gorlin (Peter Bent Brigham Hospital; Harvard University, Boston, Mass.; Mount Sinai Hospital; New York, City University, New York, N.Y.). *American Journal of Cardiology*, vol. 40, July 1977, p. 11-16. 32 refs. Research supported by the Women's Aid for Heart Research; Grants No. PHS-HL-18033-02; No. PHS-P01-HL-11306.

A77-40693 Dividing attention between auditory and visual perception. D. W. Massaro and D. S. Warner (Wisconsin, University, Madison, Wis.). *Perception and Psychophysics*, vol. 21, no. 6, June 1977, p. 569-574. 18 refs. Grant No. PHS-MH-19399.

The extent to which simultaneous visual and auditory perception is subject to capacity limitations and attentional control was investigated by asking observers to recognize test tones and test letters under selective and divided attention. In Experiment 1, both stimuli occurred on each trial, but subjects were cued in advance to process just one or both of the stimuli. In Experiment 2, subjects processed one stimulus and then the other or processed both stimuli simultaneously. Processing time was controlled using a backward recognition masking task. A significant, but small, attention effect was found in both experiments. The present positive results weaken the interpretation that previous attentional effects were due to the particular duration judgment task that was employed. The degree of capacity limitations and attentional control during visual and auditory perception appears to be small but significant. (Author)

A77-40738 # Method of photoelectric nystagmography (K metodike fotoelektricheskoi nistagmografii). B. M. Zargarian, G. M. Gigineishvili, and K. G. Karakozov (Tbilisskii Gosudarstvennyi Institut Usovershenstvovaniia Vrachei, Tiflis, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 85, Mar. 1977, p. 725-728. 22 refs. In Russian.

A photoelectric nystagmograph has been designed and tested. This nystagmograph contains two flexible optical light guides, hinged devices fixed on a light head helmet, and a highly sensitive photomultiplier. Optokinetic, thermal, and galvanic stimuli were studied. The results indicate that the nystagmograph can measure eye movements whose amplitude is as small as 0.1 deg. M.L.

A77-40790 # Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation (O vozmozhnosti protivoluchevoi zashchity geneticheskogo apparata zhivotnykh i cheloveka s pomoshch'iu gazovoi gipoksicheskoi smesi /GGS-10/ pri malykh dozakh radiatsii). R. B. Strelkov, N. B. Strazhevskaia, L. P. Kosichenko, A. Ia. Chizhov, M. Ia. Ronin, V. A. Struchkov, and A. M. Kuzin (Akademiia Nauk SSSR, Institut Biologicheskoi Fiziki, Pushchino-on-Oka; Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 233, Apr. 21, 1977, p. 1219-1221. 12 refs. In Russian.

A77-40795 # Ultrasensitivity of Drosophila mutants to ionizing radiation (Sverkhchuvstvitel'nye k ioniziruiushchei radiatsii mutanty drozofily). Iu. M. Khromykh, E. R. Varentsova, and I. A. Zakharov (Akademiia Nauk SSSR, Institut Iadernoi Fiziki, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 234, May 1, 1977, p. 199-202. 10 refs. In Russian.

A77-40881 # The effect of experimentally-induced generalized convulsions on the cycle of wakefulness and sleep (Vliianie eksperimental'no vyzvannykh generalizirovannykh sudorog na tsikl bodrstvovanie-son). M. G. Koridze, M. M. Mgaloblishvili, and M. G. Kavkasidze (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis, Georgian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 63, May 1977, p. 617-625. 20 refs. In Russian.

Generalized convulsions were induced in cats by electrodes introduced into the dorsal hippocamus. Distinct disruptions of the cycle of wakefulness and sleep were subsequently observed. Wakefulness was prolonged in the postconvulsive period, and the duration

of paradoxal sleep was sharply decreased. Little change in slow wave patterns was noted. The effect was less pronounced after generalized seizures induced by amygdaloid stimulation. In animals previously deprived of paradoxal sleep, the normal pattern of compensation seemed to be replaced by the effect of convulsions, leading to the suggestion that the function of paradoxical sleep may be periodical increase in brain activity during sleep. C.K.D.

A77-40882 # The effect of decimeter waves on central cerebral structures (Izbiratel'noe deistvie detsimetrovykh voln na tsentral'nye struktury mozga). V. R. Faitel'berg-Blank and G. M. Perevalov (Odesskii Sel'skokhoziaistvennyi Institut, Odessa, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 63, May 1977, p. 668-672. 28 refs. In Russian.

The sensitivity of central cerebral structures to the action of the electromagnetic fields of decimeter waves (DMW) was studied by observing the unit activity of comissural neurons. The greatest sensitivity to DMW was found in neurons of hypothalamus and hippocampus. Neurons of the midbrain reticular formation and of the specific thalamic nuclei displayed mainly an inhibitory response. The number of neurons responding to the DMW varied depending on the energetical density. (Author)

A77-40883 # The effect of some catecholamines on pulmonary circulation (Vliianie nekotorykh katekholaminov na legochnoe krovoobrashchenie). V. A. Tsybenko and M. A. Navakatikian (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 63, May 1977, p. 707-714. 21 refs. In Russian.

Results of a comparative study of the effects of different doses of adrenaline, noradrenaline, and isadrine on pulmonary circulation are presented. Injections of 0.1 to 1.0 microgram/kg adrenaline, noradrenaline, or isadrine produced a 13 to 200% increase in right ventricle pressure in anesthetized dogs, with isadrine producing the sharpest effects. In the case of animals in which the lung was perfused by venous blood under constant pressure, addition of noradrenaline or adrenaline to the perfusate produced a decrease in blood flow and an increase in vascular resistance. A similar reaction was induced by isadrine in about 33% of the cases; in the remainder the opposite was observed. Reactions to noradrenaline and adrenaline were inhibited by phentolamine; reactions to isadrine were blocked by inderal. It is concluded that adrenaline and noradrenaline constrict pulmonary vessels by activating their alpha-adrenoreceptors, while isadrine acts on beta-adrenoreceptors. Results suggest that in artificial perfusion isadrine dilates pulmonary vessels, whereas it has the opposite effect in the intact system. C.K.D.

A77-40884 # Antibodies to the entire synthetic gastrin molecule in the blood of healthy humans (Antitela k polnoi molekule sinteticheskogo gastrina v krovi u zdorovykh liudei). M. V. Polosatov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 63, May 1977, p. 750-752. 8 refs. In Russian.

A77-40942 Fire injuries and the pathology and neuropathology of single acute exposures to combustion products - Pathology and neuropathology of aircraft fire victims. M. L. Grunnet (Utah, University, Salt Lake City, Utah). *National Fire Protection Association, International Seminar on Aircraft Rescue and Fire Fighting, Geneva, Switzerland, Sept. 13-17, 1976, Paper.* 17 p. 14 refs. NSF Grant No. ENV-72-03406A06; Grant No. NBS-5-9006.

A review is presented of the factors leading to human incapacitation or death in aircraft accidents involving fire. Special emphasis has been directed toward the toxicological effects produced during the thermal decomposition and combustion of natural and synthetic materials. The results of controlled small-scale laboratory combustion inhalation experiments are presented. The specific effects of particular toxicants and mixtures of toxicants on tissue and organ systems are discussed. The importance of the utilization of both an analytical bioassay protocol and behavioral procedure in the evaluation of untoward human physiological response during fire exposure is discussed in detail. (Author)

A77-40945 Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires - The assessment of the human survival response during aircraft accidents. I. N. Einhorn (Utah, University, Salt Lake City, Utah). *National Fire Protection Association, International Seminar on Aircraft Rescue and Fire Fighting, Geneva, Switzerland, Sept. 13-17, 1976, Paper.* 24 p. 23 refs. Navy-supported research; NSF Grant No. ENV-72-03406A06; Grant No. NBS-5-9006.

Analysis of the factors involved in numerous aircraft fires, where impact injuries were not implicated, reveals that most deaths are not due to flame contact, but are a consequence of the production of carbon monoxide, nitrogen oxides, and other combustion products, such as aldehydes, ketones, low-molecular-weight alcohols, hydrogen cyanide, and other toxic species. This paper deals with behavioral and bioassay protocol developed to assess the effect of combustion products on human survival during fire exposure. The major techniques many toxicologists use to assess the toxicological parameters encountered during 'real fires' are reviewed. Finally, a full-scale adaptation of laboratory procedures developed for use in actual aircraft fire scenarios is described. (Author)

A77-40949 Necessary medical and paramedical measures for an airport catastrophe (Moyens médicaux et para-médicaux necessaires en cas de catastrophe sur aéroport). G. Bergot (Aéroport de Paris, Direction du Personnel, Paris, France). *National Fire Protection Association, International Seminar on Aircraft Rescue and Fire Fighting, Geneva, Switzerland, Sept. 13-17, 1976, Paper.* 13 p. In French.

Procedures for dealing with a major aircraft accident in the vicinity of an airport are discussed with reference to triage, transportation of wounded, and equipment. Also considered is the number of doctors and support staff who would be needed. Although planners should realize that, in situations of stress, errors and difficulties will occur in implementing plans, the need for formulating plans in advance is stressed. A survey of resources available in the vicinity of a small airport not near a large city is suggested, and a list is provided of items to be surveyed. M.L.

A77-41064 # Psychopharmacology in aviation and astronautics (Psikhofarmakologiia v aviatsii i kosmonavtike). P. V. Vasil'ev and G. D. Glod. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina*, vol. 11, May-June 1977, p. 3-11. 104 refs. In Russian.

Flights aboard modern vehicles are associated with high nervous, emotional and physical stresses. This may induce depletion of reserve capabilities, development of fatigue and, consequently, reduction of work capacity of crewmembers. Results of the use of drugs by pilots and cosmonauts to alleviate their fatigue and emotional stress are presented. Indications and contraindications for the administration of stimulants and tranquilizers are discussed. On the basis of a comprehensive analysis of the literature data and their own findings, it is concluded that the use of stimulants and anxiolytics may increase the level of reliability and performance of air- and spacecraft pilots during programmed and, particularly, contingent flight situations. (Author)

A77-41065 # The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight (Sostoianie mikroskopicheskoi i kristallicheskoi struktur, mikrotverdosti i mineral'noi nasyshchennosti kostnoi tkani, cheloveka posle dlitel'nogo kosmicheskogo poleta). O. G. Gazenko, A. A. Prokhonchukov, V. V. Panikarovskii, R. A. Tigranian, A. G. Kolesnik, G. N. Pakhomov, A. S. Grigor'ian, Z. P. Antipova, S. M. Remezov, and N. A. Komissarova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina*, vol. 11, May-June 1977, p. 11-20. 10 refs. In Russian.

A77-41066 # Characterization of regional circulation and vasomotor regulation after a two-month space flight (Osobennosti regionarnogo krovoobrashcheniia i vazomotornoi reguliatsii posle

dvukhmesiachnogo kosmicheskogo poleta). Kh. Kh. Iarullin and T. D. Vasil'eva. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 20-26. 17 refs. In Russian.

Results of rheographic study of regional hemodynamics of Soyuz-18 - Salyut-4 crewmembers at rest and during orthostatic tests before and after their 63-day space flight are presented. On the 1st postflight day a marked decrease of dicrotic and diastolic indices in hemispheric rheoencephalograms of both cosmonauts and in bimastoidal rheoencephalograms of Sevastianov was noted. A noticeable increase in the cerebral pulse blood filling subsequently occurred in Sevastianov; in Klimuk, a slight decrease of the hemispheric blood filling was noted. A marked asymmetry of rheoencephalograms, especially of the vascular tone, was detected. On the 1st postflight day orthostatic tolerance was diminished, particularly in Klimuk, who showed arteriolar and venous hypotension of cerebral vessels in the vertebral-basillary system. Sevastianov exhibited hypotension primarily in the basin of the interior carotid artery. Responses of the regional hemodynamics to orthostatic tests in both cosmonauts improved continuously and reached the preflight level by the 16th postflight day. (Author)

A77-41067 # Circulation studies during LBNP aboard the orbital station Salyut-4 (Issledovaniia krovoobrashcheniia pri ODNT na orbital'noi stantsii 'Saliut-4'). V. A. Degtiarev, V. G. Doroshev, T. V. Batenchuk-Tusko, Z. A. Kirillova, N. A. Lapshina, S. I. Ponamarev, and V. N. Ragozin. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 26-31. 7 refs. In Russian.

The orthostatic tolerance of the Salyut-4 crewmembers was measured by means of lower body negative pressure (LBNP) tests (-25 mm Hg for 2 min followed by 3 min at -35 mm Hg). Orthostatic tolerance decreased but remained satisfactory throughout the 2-month flight. During LBNP tests the pattern of most cardiovascular changes inflight and on the earth was similar. In weightlessness heart rate increased, reaching maximum preflight values. Cardiac output and stroke volume decreased noticeably, and significant changes in the systolic time interval occurred. The recommended regimen of LBNP did not adversely affect the health of crewmembers and was adequate for predicting their orthostatic tolerance. Criteria for the evaluation of the health condition of space crewmembers were developed. (Author)

A77-41068 # Changes in the orthostatic stability of cosmonauts after space flights of 2 to 63 days' duration (Dinamika ortostaticheskoi ustoichivosti kosmonavtov posle poletov prodolzhitel'nost'iu ot 2 do 63 sut). V. V. Kalinichenko. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 31-37. 10 refs. In Russian.

A77-41069 # Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts (Nekotorye psikhonevrologicheskie trebovaniia pri otsenke funktsional'nogo sostoianiia kosmonavtov v polete). V. I. Miasnikov, O. V. Kon'kova, and F. N. Uskov. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 37-39. In Russian.

A screening test for use in selecting individuals who will be responsible for evaluating and reporting the psychoneurological condition of crew members during space flight is suggested. A group of men was presented with a set of triads - a test word plus two synonyms. Subjects were asked to select the synonym which they believed to have the meaning closest to that of the test word. Certain triads were repeated in the set. The number of times a subject changed his opinion on these triads when he was in a normal state was compared to the number of opinion changes when he had received pyridrol, aminazine, or a placebo. It was found that opinion stability varied widely from individual to individual. It is suggested that opinion stability tests be administered during the screening procedure for psychoneurologists responsible for monitoring members of a space crew in flight. C.K.D.

A77-41070 # A histochemical study of the digestive organs of mice following flight aboard Cosmos-605 (Gistokhimicheskoe issledovanie organov pishchevareniia krys posle poleta na 'Kosmos-605'). M. G. Shubich, L. L. Goriacheva, V. I. Dudetskii, N. M. Lutsenko, and G. M. Mogil'naia. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 40-44. 14 refs. In Russian.

A77-41071 # Mucopolysaccharides and collagen in tissues of hypokinetic rats (Mukopolisakharidy i kollagen tkanei pri gipokinezii u krys). P. P. Potapov. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 44-48. 19 refs. In Russian.

A study of 98 rats showed an increased amount of collagen in the skeletal muscle, heart and kidneys of rats exposed to prolonged hypokinesia. The content of hexosamines decreased in the skeletal muscle, liver and brain and increased in the heart. The content of hexuronic acids increased in the skeletal muscle and kidneys and decreased in the heart. By the 60th day of the recovery period the collagen content in the skeletal muscle had not returned to normal. Changes in the content of mucopolysaccharides in the liver, heart, brain and skeletal muscle were in some cases more pronounced after than during exposure to hypokinesia. The observed changes are discussed in terms of their possible effect on tissue permeability and fluid-electrolyte metabolism of hypokinetic animals. (Author)

A77-41072 # Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man (Serdechno-sosudistye reaktsii pri ortostaticheskikh probakh i rezistentnost' cheloveka k vestibuliabnym razdrazhiteliam). B. I. Poliakov, B. E. Petrenko, A. B. Savin, I. G. Tazetdinov, and A. M. Tarko. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 48-52. 13 refs. In Russian.

A77-41073 # Dynamic control of space cabin environmental parameters (O dinamicheskom upravlenii parametrami atmosfer kosmicheskikh apparatov). I. S. Breslav and V. N. Salazkin. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 53-58. 10 refs. In Russian.

A mathematical model of relationships between physiological parameters, oxygen content in the atmosphere and exercises has been developed on the basis of experimental data. Using the model, it has been demonstrated that circulation and respiration reactions to exercises can be optimized by increasing the partial pressure of oxygen. A law for the dynamic and physiologically optimal control of the oxygen content in the space cabin atmosphere has been advanced. In cases of an uncontrolled decrease of PO2 the oxygen supply of crewmembers can be optimized by dynamic control of the ambient CO2 content. (Author)

A77-41074 # Respiratory mechanics during speech in the course of static physical exercise (Mekhanika dykhaniia pri rechi vo vremia staticheskoi fizicheskoi nagruzki). M. A. Tikhonov and A. S. Belan. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 58-63. 10 refs. In Russian.

A77-41075 # The electrolyte content in the blood of animals and transport of potassium-ion erythrocytes under a constant magnetic field (Soderzhanie elektrolitov v krovi zhivotnykh i transport ionov kaliia v eritrotsitakh pri vozdeistvii postoiannogo magnitnogo polia). G. K. Gerasimova and Z. N. Nakhil'nitskaia. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 63-67. 7 refs. In Russian.

A77-41076 # Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses (Krovetvorenie sobak, obluchennykh protonami v smertel'nykh dozakh pri ekranirovanii kostnogo mozga). G. F. Nevskaia, G. M. Abramova, E. V. Ginsburg, D. N. Tshmukhametova, and A. S. Skorik. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 67-70. 10 refs. In Russian.

A77-41077 # Microflora associated with beets during their growth in prolonged hydroponic cultivation (Izuchenie kharaktera soputstvuiushchei mikroflory pri dlitel'nom bessubstratnom kul'tivi-

rovanii rastenii svekly). L. S. Iunusova and N. A. Drugova. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 71-74. In Russian.

A quantitative and qualitative study was made of the population of microflora associated with beets in hydroponic cultivation. The maximum number of microorganisms in the nutrient solution occurred during the period of intensive growth; the population density of microorganisms subsequently decreased gradually to harvest. The population of microorganisms on the surface of the root was found to be much larger than that in the nutrient solution. The population of ammonifiers and nitrifiers in the nutrient solution had increased significantly by the end of the vegetative period; a decrease in the number of denitrifiers present on the roots was observed during vegetation. C.K.D.

A77-41078 # Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605 (Geterofil'nye antitela i komplementarnaia aktivnost' syvorotki krovi krys posle poleta na sputnike 'Kosmos-605'). V. V. Portugalov, A. A. Ivanov, and V. N. Shvets. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 76-78. 8 refs. In Russian.

A77-41079 # The blood coagulation system during a 12-day immersion in water and the prophylactic role of rotation in a centrifuge (Svertyvaiushchaia sistema krovi pri 12-sutochnoi vodnoi immersii i profilakticheskaia rol' vrashchenii na tsentrifuge). M. A. Khudiakova and E. B. Shul'zhenko. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 79-81. 19 refs. In Russian.

A77-41080 # Defensive reactions of the organism when breathing elevated CO2 concentrations (O zashchitnykh reaktsiiakh organizma pri dykhanii povyshennymi kontsentratsiiami uglekisloty). O. Iu. Sidorov and Z. K. Sulimo-Samuillo. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 81-83. In Russian.

A77-41081 # The effect of gamma-radiation on the ammonia excretion of white mice (Vliianie gamma-radiatsii na intensivnost' vydeleniia ammiakh belymi krysami). K. P. Bugar', V. V. Kustov, B. I. Abidin, and L. T. Poddubnaia. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 83, 84. 12 refs. In Russian.

A77-41082 # Function of the otolithic apparatus of cosmonauts following space flight (Funktsiia otolitovogo apparata kosmonavtov posle kosmicheskogo poleta). F. A. Solodovnik. *Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina,* vol. 11, May-June 1977, p. 85, 86. 9 refs. In Russian.

A77-41151 # Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects (Issledovanie sutochnoi periodiki fiziologicheskikh funktsii dlia otsenki sostoianiia reguliatornykh sistem organizma pri ekstremal'nykh vozdeistviiakh). R. M. Baevskii, G. A. Nikulina, and T. D. Semenova. *Fiziologiia Cheloveka,* vol. 3, May-June 1977, p. 387-393. 23 refs. In Russian.

The diurnal rhythms of body temperature, salt levels in saliva, and heart rate statistical characteristics were studied as a means of estimating the physiological state of organisms. Changes in these physiological indices were investigated during: the development of a work and rest regime, a 64-hour period of constantly being awake, and a 120-day period of hypokinesia. Criteria were developed for evaluating the state of stress, overexhaustion, and asthenia of the regulatory systems brought about by extreme effects. M.L.

A77-41152 # Study of color vision by the method of recording induced potentials (Issledovanie tsvetovogo zreniia metodom registratsii vyzvannykh potentsialov). L. P. Grigor'eva (Akademiia Pedagogicheskikh Nauk SSSR, Nauchno-Issledovatel'skii Institut Defektologii, Moscow, USSR). *Fiziologiia Cheloveka,* vol. 3, May-June 1977, p. 441-448. 30 refs. In Russian.

Amplitude-time characteristics of occipital induced potentials evoked in response to primary color monochromatic signals are compared with physiological indices of color perception for the purpose of studying the mechanism of human color differentiation. People with color-blind and normal vision were subjects. The third and fourth components of the induced potentials were correlated with the opponent traits during perception of chromatic contrasts as determined by physiological data. The induced potential response of people with defective vision is examined. The applicability of opponent-color theories is considered. M.L.

A77-41153 # EEG correlates of the quality of work of an operator during different functional states (EEG-korreliaty kachestva raboty operatora pri ego razlichnykh funktsional'nykh sostoianiiakh). A. V. Miroliubov (Voenno-Meditsinskaia Akademiia, Leningrad, USSR). *Fiziologiia Cheloveka,* vol. 3, May-June 1977, p. 475-481. 8 refs. In Russian.

The dynamics of the EEG alpha rhythms of operators during exhaustion and inhalation of hypoxic mixtures were studied for the purpose of correlating variations in the alpha rhythm with quality of work. Increased average durations of both the alpha waves and the ascending phase of the alpha waves are correlated with a decrease in the quality of work caused by exhaustion or hypoxia. It is suggested that these changes in the alpha wave pattern might serve as diagnostic characteristics for the initial stages of exhaustion or hypoxia. M.L.

A77-41154 # Features of the cerebral and peripheral blood circulation in healthy people of different ages (Osobennosti mozgovogo i periphericheskogo krovoobrashcheniia u zdorovykh liudei razlichnogo vozrasta). A. K. Gus'kova, V. V. Kharitonov, V. A. Iadrintsev, and V. P. Ishchenko. *Fiziologiia Cheloveka,* vol. 3, May-June 1977, p. 493-499. 19 refs. In Russian.

Four groups of healthy construction workers (male, female; age 36-45, 46-55) were studied with respect to their cerebral and peripheral blood circulation and the elasticity characteristics of their arteries. More age-related changes were found in women in the 46-55 age group than in men of the same age group. The older age groups for both sexes revealed more hypertonic changes than organic changes. Significant differences between the age groups were observed in the elasticity of large arteries. M.L.

A77-41224 # Formation of additional nerve connections of the common carotid artery (Obrazovanie dopolnitel'nykh nervnykh sviazei obshchei sonnoi arterii). D. M. Golub and I. I. Novikov (Akademiia Nauk Belorusskoi SSR, Institut Fiziologii, Minsk, Belorussian SSR). *Akademiia Nauk BSSR, Doklady,* vol. 21, June 1977, p. 563-566. 8 refs. In Russian.

Experiments on cats were performed in which the large acoustic nerve was sewn onto the middle part of the common carotid artery. Adhesion at the suture was formed, consisting of connective tissue without a noticeable boundary passing into the adventitia of the artery. By neurohistological methods it was established that ingrowing of young regenerative axons of the sewn nerve into the adhesion took place. Nerve fibers were traced up to the adventitia of the vessel. It is assumed that new afferent nerve connections of the common carotid artery with the central nervous system were formed. P.T.H.

A77-41225 # Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus (Sinteticheskii podkhod k otsenke fiziologicheskikh, predpatologicheskikh i patologicheskikh sostoianii apparata krovoobrashcheniia). N. I. Arinchin, L. M. Mazhul', G. D. Nedvetskaia, Z. K. Sil'von, and S. A. Iaroshevich (Akademiia Nauk Belorusskoi SSR, Institut Fiziologii and Sektor Gerontologii, Minsk, Belorussian SSR). *Akademiia Nauk BSSR, Doklady,* vol. 21, June 1977, p. 567-570. 10 refs. In Russian.

A classification of physiological states of the cardiovascular system into types of self-regulation of the circulation is refined with the aid of unified indices - the blood supply index and the index of

peripheral resistance - and some new experimental data on the active participation in hemodynamics of numerous intramuscular peripheral 'hearts' and their close interaction with the central heart. Criteria for detection and classification of prepathological and pathological states of the circulatory apparatus are proposed. P.T.H.

A77-41230 # Is the method for 'perception time' measurement adequate. S. Mateev (B'lgarska Akademiia na Naukite, Institut po Fiziologiia, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 30, no. 4, 1977, p. 603-606. 8 refs.

A procedure for determining perception time was tested. This procedure, developed by Hazelhoff and Wiersma (1924), requires subjects to state the location of a brief light stimulus which appears on a moving target. But it is now known that the position of a brief light stimulus is incorrectly located when the stimulus is presented during or just before a saccadic eye movement, and the mistaken location may be either in the direction of eye movement or opposite to it. The original perception experiment was repeated using a larger set of tracking velocities and with attention to subjects' eye movements. The results show that the procedure does not provide a good measurement of perception time. A linear relationship was found between the tracking velocity and the difference between the real and stated position, but the line does not pass through the origin. M.L.

A77-41416 # Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis (Izuchenie vliianiia sverkhvysokochastotnogo elektromagnitnogo polia na kletki krovi zhivotnykh v ontogeneze). P. A. Khakimov, T. M. Mamanov, A. K. Kozhabekov, and I. A. Shutova (Srednеaziatskii Meditsinskii Pediatricheskii Institut, USSR). *Akademiia Nauk Uzbekskoi SSR, Doklady*, no. 2, 1977, p. 65, 66. 5 refs. In Russian.

A77-41456 Human performance and transmissibility under sinusoidal and mixed vertical vibration. H. H. Cohen, D. E. Wasserman, and R. W. Hornung (U.S. Department of Health, Education, and Welfare, National Institute for Occupational Safety and Health, Cincinnati, Ohio). *Ergonomics*, vol. 20, May 1977, p. 207-216. 10 refs.

Six subjects performed a four-limb coordination task on a shaker table driven by both single sinusoidal frequencies of 2.5 Hz and 5.0 Hz, as well as by an electronic mixture of 2.5 Hz and 5.0 Hz. Vibration acceleration was held constant at 0.69 m/sec squared (0.07 gz) rms a level below the international standard 'fatigue-decreased proficiency' boundary for 2.5 h vertical vibration exposures. Although vibration transmission through the body was equally as strong for the mixture comprised of only a 50% 5.0 Hz component as for the pure 5.0 Hz sinusoid, performance data indicated greatest overall impairment of response speed and greatest 'fatigue-decreased proficiency' under exposure to the vibration mixture. The vibration 'crest factor' is offered as a possible explanation of the results which question a basic assumption of the international standard for exposure to whole body vibration that sinusoidal vibration data are directly generalisable to more realistic environmental exposures. (Author)

A77-41457 The use of an intensity matching technique to evaluate human response to whole-body vibration. L. C. Fothergill and M. J. Griffin (Southampton, University, Southampton, England). *Ergonomics*, vol. 20, May 1977, p. 249-261. 12 refs.

Previous whole-body vibration intensity matching experiments have been reviewed and some of the different experimental methods and findings are discussed. An experiment has been conducted to investigate 'between' and 'within' subject variability in such experiments and to determine the effect of varying the frequency of the standard vibration against which other frequencies are matched. Although subjects had only a low confidence in their matches the 'within' subject variability was low and much smaller than 'between' subject variability. As the frequency separation of the two vibrations to be matched became greater the subject variability increased. Although only relatively small differences were found between the results obtained with different frequency standards it was concluded that a 10 Hz sinusoid was to be preferred for future experimentation. The differences found between the responses of individual subjects emphasize the need for a careful consideration of individual differences in human response to whole-body vibration. (Author)

A77-41458 The evaluation of discomfort produced by multiple frequency whole-body vibration. L. C. Fothergill and M. J. Griffin (Southampton, University, Southampton, England). *Ergonomics*, vol. 20, May 1977, p. 263-276. 12 refs.

The discomfort produced by multiple frequency whole-body vertical vibration has been studied. Subjects adjusted the level of a 10 Hz sinusoidal vibration such that it produced a degree of discomfort equivalent to that caused by a variety of multiple frequency stimuli, including motions containing predominant beats and up to four sinusoidal components. The levels of the 10 Hz vibration equivalent to the complex motions were always well predicted by the root mean square of the levels of 10 Hz equivalent to the individual sinusoidal components in the complex motion. The equivalent discomfort of the multiple frequency motions could be determined by weighting the vibration spectrum with an electronic network having a frequency response given by the manner in which discomfort due to vibration varies with vibration frequency. An investigation of the possibility of inhibition occurring in the response to multiple frequency motions indicates that the complexity inherent in methods based on models of inhibition was unnecessary. These results are compared with the procedures for assessing multiple frequency motions given in the current international standard on the evaluation of human exposure to whole-body vibration. (Author)

A77-41639 * Possible surface reactions on Mars - Implications for Viking biology results. C. Ponnamperuma, A. Shimoyama, M. Yamada, T. Hobo, and R. Pal (Maryland, University, College Park, Md.). *Science*, vol. 197, July 29, 1977, p. 455-457. 8 refs. Grant No. NGR-21-002-317.

The results of two of the three biology experiments carried out on the Viking Mars landers have been simulated. The mixture of organic compounds labeled with carbon-14 used on Mars released carbon dioxide containing carbon-14 when reacted with a simulated Martian surface and atmosphere exposed to ultraviolet light (labeled release experiment). Oxygen was released when metal peroxides or superoxides were treated with water (gas exchange experiment). The simulations suggest that the results of these two Viking experiments can be explained on the basis of reactions of the Martian surface and atmosphere. (Author)

A77-41640 Motion sickness - An evolutionary hypothesis. M. Treisman (Oxford University, Oxford, England). *Science*, vol. 197, July 29, 1977, p. 493-495. 8 refs. Research supported by the Medical Research Council of England.

Since the occurrence of vomiting as a response to motion is both widespread and apparently disadvantageous, it presents a problem for evolutionary theory. An hypothesis is proposed suggesting that motion sickness is triggered by difficulties which arise in the programming of movements of the eyes or head when the relations between the spatial frameworks defined by the visual, vestibular, or proprioceptive inputs are repeatedly and unpredictably perturbed. Such perturbations may be produced by certain types of motion, or by disturbances in sensory input or motor control produced by ingested toxins. The last would be the important cause in nature, the main function of the emesis being to rid the individual of ingested neurotoxins. Its occurrence in response to motion would be an accidental by-product of this system. (Author)

A77-41652 Gravitation and the living organism (Gravitatsiia i organizm). Edited by N. P. Dubinin. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 33), 1976. 288 p. In Russian.

A series of articles summarizing current knowledge regarding the effect of gravitation on the vital processes of living organisms is presented. General subjects include the role of gravitation in evolution, the influence of gravitation on the growth and development of organisms, and the effect of weightlessness on living

organisms. Individual articles cover such topics as the effect of gravitation on the evolution of the skeleton of vertebrates and on the structural and functional organization of statocycts in cephalopods, the physiological effects of variable gravitation, the influence of gravitation on the size of organisms, the effect of space flight on microorganisms, and the growth and development of higher plants under simulated weightlessness. C.K.D.

A77-41748 # Convective and radiative heat transfer coefficients for the human body. T. Mochida (Hokkaido University, Sapporo, Japan). *Hokkaido University, Faculty of Engineering, Bulletin*, July 1977, p. 1-11. 13 refs.

An equation is derived for the mean convective heat transfer coefficient (MCHTC) for the human body; the MCHTC is taken as the sum of local convective coefficients weighted with each skin area ratio. Values calculated at each air flowspeed were used in an approximation for the whole-body MCHTC which is then compared to similar expressions derived by other authors. A parameter termed environmental radiant temperature, averaged and weighted by the absorption factors between the human body and the surrounding walls, is arrived at by appropriate simplifications and linearization. R.D.V.

A77-41787 Psychological issues in manned spaceflight. H. Pickett (Department of Defence /Air/, Pearce, Australia). In: Australian Astronautics Convention, Perth, Australia, August 27-30, 1975, Proceedings. (A77-41785 19-12) Perth, Astronautical Society of Western Australia, Inc., 1977, p. 17-37. 129 refs.

Various psychological aspects of manned space flight (particularly Apollo-Soyuz and Skylab) are discussed including the effects of isolation, personality characteristics, and the matching of astronaut with function. Australian research with military pilots is discussed in reference to space-flight psychology. This involved visual-vestibular dissociation testing using the visual distortion test and the disk and frame test, personality integration testing, and the relation of personality dynamics to visual-vestibular dissociation. A comprehensive bibliography is provided. B.J.

A77-41813 * Total body water and lean body mass estimated by ethanol dilution. J. A. Loeppky, L. G. Myhre, M. D. Venters, and U. C. Luft (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 803-809. 31 refs. Contract No. NAS9-14472.

A method for estimating total body water (TBW) using breath analyses of blood ethanol content is described. Regression analysis of ethanol concentration curves permits determination of a theoretical concentration that would have existed if complete equilibration had taken place immediately upon ingestion of the ethanol; the water fraction of normal blood may then be used to calculate TBW. The ethanol dilution method is applied to 35 subjects, and comparison with a tritium dilution method of determining TBW indicates that the correlation between the two procedures is highly significant. Lean body mass and fat fraction were determined by hydrostatic weighing, and these data also prove compatible with results obtained from the ethanol dilution method. In contrast to the radioactive tritium dilution method, the ethanol dilution method can be repeated daily with its applicability ranging from diseased individuals to individuals subjected to thermal stress, strenuous exercise, water immersion, or the weightless conditions of space flights. J.M.B.

A77-41814 Assessment of maximal aerobic power in specifically trained athletes. S. B. Stromme, F. Ingjer, and H. D. Meen (Norwegian College of Physical Education and Sport, Oslo, Norway). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 833-837. 32 refs.

A77-41815 * Effects of growth, diving history, and high altitude on blood oxygen capacity in harbor seals. A. M. Kodama, R. Elsner, and N. Pace (California, University, Berkeley and La Jolla, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 852-858. 23 refs. Grant No. NGL-05-003-024.

Blood volume and body composition for diving and nondiving harbor seals were measured at six-week intervals during a 10-month period of captitivity. Whole body hematocrit, red cell volume per kg of lean body mass, and total circulating hemoglobin per kg lean body mass were significantly higher in the diving group, but relatively large blood volumes expressed in terms of body weight (11-12%) were found in both groups. A pair of harbor seals exposed to high altitude for about three months registered significant increases in red cell volume, blood hemoglobin levels, and blood volume expressed in terms of body weight; results of alveolar gas analyses indicate that hyperventilation also occurred. These typical mammalian responses to hypoxia suggest that the harbor seal's large blood volume and high hemoglobin content are an expression of phylogenetic control, and that in spite of its adaptability to apnea during its diving life, the animal cannot be considered preacclimatized to high altitude. J.M.B.

A77-41816 Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man. D. Collen, J. P. Tricot, J. Vermylen (Leuven, Katholieke Universiteit, Louvain, Belgium), and N. Semeraro. *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 865-873. 32 refs. Research supported by the Fonds voor Geneeskundig Wetenschappelijk Onderzoek of Belgium.

The turnover of fibrinogen, plasminogen, and prothrombin labeled with isotopes of iodine was studied in 16 subjects before and during vigorous exertion. After 4 to 5 days of normal physical activity, in which concentrations and turnover rates of the labeled proteins were calibrated (a mathematical model for determination of the metabolism of the tracer proteins is given), the subjects undertook a program of vigorous exercise. No reduction in the concentration of any of the three proteins was observed, but increased catabolism of fibrinogen and plasminogen, though not of prothrombin, was recorded. However, the absence of prothrombin metabolism, together with the increased presence of degraded fibrinogen chains in the plasma, suggests that the catabolism of fibrinogen during exertion is linked not to intravascular coagulation, but to fibrinogenolysis. Thus, activation of the fibrinolytic system (plasminogen consumption), which in this case occurs without activation of the coagulation system (prothrombin consumption), indicates that exercise may have a favorable effect in preventing thrombosis. J.M.B.

A77-41817 Limits on Va/Q distributions from analysis of experimental inert gas elimination. J. W. Evans and P. D. Wagner (California, University, La Jolla, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 889-898. 20 refs. Grants No. PHS-HL-17731; No. PHS-HL-00111.

The distribution of ventilation-perfusion ratios in the lung are studied, with emphasis on adapting inert gas elimination methods to generation of data having physiological significance and clinical usefulness. Current techniques for analyzing inert gas data, which employ a compartmental model of steady-state elimination, are modified to form the basis of methods for exploring variable distributions of ventilation-perfusion ratios. A linear programming technique which treats the case of six inert gases as well as a simpler two-gas case is found to yield usable information, including: determination of the maximum compartmental perfusion; specification of whether the perfusion distribution is unimodal or not; and specification of whether the ventilation distribution is unimodal or not. In clinical practice, a uni- or bimodal distribution of perfusion-ventilation ratios and the location of maximum and minimum arterial retentions can be reliably determined by application of a 50-compartment analysis using constrained least square compartments with statistical regularization of data. J.M.B.

A77-41818 Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man. M. A. Hutcheon, J. R. Rodarte, and R. E. Hyatt (Mayo Clinic and Mayo Foundation,

Rochester, Minn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 899-902. 11 refs. Grants No. NIH-HL-12229; No. NIH-HL-16726; No. NIH-HL-70816.

Static lung volume and static elastic recoil pressure were measured in 22 normal subjects breathing air and a mixture of 80% helium and 20% oxygen. When subjects first breathed air and then the helium-oxygen mixture, small but significant increases in total lung capacity (a mean of 0.11 liter) and in residual volume (a mean of 0.10 liter) were registered, but small increases in the vital capacity of some subjects did not translate into significant changes in vital capacity in the group. Pressure-volume measurements made at various lung volumes on 10 subjects showed no significant effect on elastic recoil pressure as a result of breathing the helium-oxygen mixture. The density dependence of flow was also studied; the dependence was somewhat greater for nonsmoking subjects than for smokers. In conclusion, breathing the helium-oxygen mixture was found to produce changes in static lung volume not readily explained by differences in viscosity and density; however these effects can be safely ignored in clinical applications of maximal expiration flow-volume curves. J.M.B.

A77-41819 Thermoregulatory responses during competitive marathon running. M. B. Maron, J. A. Wagner, and S. M. Horvath (California, University, Santa Barbara, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 909-914. 24 refs. Grant No. AF-AFOSR-73-2455.

To provide information concerning thermoregulation during a marathon race, rectal and skin temperatures were monitored at nine-minute intervals in two highly-trained individuals during a marathon (running time of more than 160 minutes in each case). Mean skin temperature was similar for both runners throughout the race, though they exhibited varied readings at different skin sites. Rectal temperature was found to plateau after 35 to 45 minutes (at 40.0 to 40.1 C for the first participant and 38.9 to 39.2 for the second). The first runner showed a secondary increase in rectal temperature at about the three-quarter mark, apparently due to (or at least accompanied by) a decrease in sweating; however, his ability to continue the pace for the remainder of the marathon suggests that thermoregulation remained in effect and that in some cases prolonged heavy work may be performed under conditions of high rectal temperature. Total water losses were also recorded (3.02 kg for the first runner and 2.43 kg for the second) and an average total thermal balance for the two subjects was estimated. J.M.B.

A77-41820 Dynamic and steady-state respiratory responses to bicycle exercise. D. H. Pearce (Mississippi, University, Jackson, Miss.) and H. T. Milhorn, Jr. (East Tennessee State University, Johnson City, Tenn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 959-967. 35 refs. Grants No. NIH-HL-18920; No. NIH-HL-18821; No. NIH-HE-11678; No. NIH-HL-5184.

The transient respiratory responses of 10 normal subjects to step changes in work load on a ergometer were determined by breath-by-breath analysis for tidal volume, minute ventilation, respiratory frequency, end-tidal oxygen and carbon dioxide tensions, oxygen uptake, carbon dioxide elimination, respiratory exchange ratio, and heart rate. Conclusions include: amplitude of fast response increases with work load, suggesting tension response from the exercising limbs as source of the fast response signal; minute ventilation is apparently a controlled variable, with respiratory frequency and tidal volume varying to maintain the required ventilation; the dynamics of the respiratory exchange rate are controlled by oxygen uptake and carbon dioxide elimination. Rapid ventilatory responses were seen at the initiation and termination of exercise; however they required up to 32.5 seconds for full development. The data, at the initiation of the exercise, are consistent with the concept of cardiodynamic hyperpnea, while the results are not as clear at the termination of the exercise. J.M.B.

A77-41821 Computer-based system for analysis of respiratory responses to exercise. D. H. Pearce, H. T. Milhorn, Jr., G. H. Holloman, Jr., and W. J. Reynolds (Mississippi, University, Jackson, Miss.; East Tennessee State University, Johnson City, Tenn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 42, June 1977, p. 968-975. 12 refs. Grants No. NIH-HL-18920; No. NIH-HI-18821; No. NIH-HE-11678; No. NIH-HL-5184.

A computer-based system for the determination of tidal volume, respiratory frequency, minute ventilation, oxygen transfer, carbon dioxide transfer, respiratory exchange rate, end-tidal carbon dioxide and oxygen tensions, and heart rate is presented. The system collects the data, analyzes it, and then stores it by printout, computer plotting, and recording on digital magnetic tape. Calibration of the analyzers is described, and a sample flow chart for the analysis of breath-by-breath respiration is given. Advantages of the system include: anomalous data are automatically edited out; data from a number of experiments can be averaged and the means plotted at 5-second intervals, with standard deviations given every 3 minutes; the basic elements of the system can be modified for a variety of respiratory experiments. J.M.B.

A77-41875 Effects of noise on sleep of babies. Y. Ando and H. Hattori (Kobe University, Kobe, Japan). *Acoustical Society of America, Journal*, vol. 62, July 1977, p. 199-204. 9 refs. Research supported by the Ministry of Education of Japan.

The reactions of babies to aircraft noise were studied by means of electroplethysmography (PLG) and electroencephalography (EEG). It was found that the babies whose mothers had moved to the area around Osaka International Airport before conception (group I) or during the first five months of pregnancy (group II) showed little or no reaction on PLG and EEG to aircraft noise. In contrast, babies whose mothers had moved close to the airport during the second half of the pregnancy or after birth (group III or IV) and the babies whose mothers lived in a quiet area (group V) reacted to the same auditory stimuli. The babies in groups I and II showed different responses depending on whether the auditory stimuli were aircraft noise or music. Abnormal PLG and EEG were observed in the majority of babies living in an area where noise levels were over 95 dBA. This suggests that the deep sleep of the babies living in such an area was disturbed. (Author)

A77-41950 Engineering models of the human thermoregulatory system - A review. C.-L. Hwang and S. A. Konz (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *IEEE Transactions on Biomedical Engineering*, vol. BME-24, July 1977, p. 309-325. 44 refs. NSF Grant No. ENG-73-03676.

The literature on engineering models of the human thermoregulatory system is reviewed and classified. The present review is a sequel to 'A Review of Mathematical Models of the Human Thermal System.' Emphasis in this review is the incorporation of physiological thermoregulation into engineering models. The objective is to present major mathematical models of human thermoregulatory systems which can be used in simulation and design for practicing engineers. (Author)

A77-42131 Some psychological correlates of motion sickness susceptibility. W. E. Collins (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.) and J. M. Lentz (U.S. Naval Aeromedical Research Laboratory, Pensacola, Fla.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 587-594. 35 refs. Research supported by the University of Oklahoma.

With reference to motion sickness, four groups - highly susceptible men, highly susceptible women, nonsusceptible men, and nonsusceptible women - were obtained from a population of college students on the basis of extreme scores on a motion sickness questionnaire. Each subject was given at least three, but not more than six, of the following eight tests: Floor Ataxia Test Battery, State-Trait Anxiety Inventory, Menstrual Distress Questionnaire, Cornell Medical Index, Cornell Word Form, Eysenck Personality Inventory, Rotter Internal-External Locus of Control Scale, and the 16 Personality Factors test. Only the ataxia battery and the Cornell Medical Index revealed significant sex differences. Susceptible

subjects did not differ significantly from nonsusceptibles on the ataxia battery but did differ significantly on all personality tests except the Menstrual Distress Questionnaire (administered only to women) and the Rotter Scale. M.L.

A77-42132 * Prolonged weightlessness effect on postflight plasma thyroid hormones. C. S. Leach, P. C. Johnson, and T. B. Driscoll (NASA, Johnson Space Center, Metabolic and Biochemistry Branch; Baylor University, Houston, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 595-597. 8 refs.

Blood drawn before and after spaceflight from the nine Skylab astronauts showed a statistically significant increase in mean plasma thyroxine (T-4) of 1.4 micro g/dl and in thyroid-stimulating hormone (TSH) of 4 microunits ml. Concurrent triiodothyronine (T-3) levels decreased 27 ng/dl indicating inhibited conversion of T-4 to T-3. The T-3 decrease is postulated to be a result of the increased cortisol levels noted during and following each mission. These results confirm the thyroidal changes noted after the shorter Apollo flights and show that thyroid hormone levels change during spaceflight. (Author)

A77-42133 Protracted radiation-stressed primate performance. M. Yochmowitz, R. Patrick, R. Jaeger, and D. Barnes (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 598-606. 16 refs.

An experimental investigation has been made of the effects of nuclear radiation on the behavior of four trained primates (rhesus monkeys) proficient in control of the primate equilibrium platform during a hypothetical 72-h aircraft mission. The radiation exposure was assumed to result from a radioactive cloud penetration at the start of the mission, with subsequent low dose rate exposure resulting from radioactive debris in and on the aircraft. Minor performance changes were detected in three of four subjects; all experienced emesis. (Author)

A77-42134 * Arousal from sleep - The physiological and subjective effects of a 15 dB/A/ reduction in aircraft flyover noise. T. E. LeVere and N. Davis (North Carolina State University, Raleigh, N.C.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 607-611. 15 refs. Grant No. NGL-34-002-095.

The present research was concerned with whether or not a 15 dB(A) reduction in overall noise level would lessen the sleep disturbing properties of jet aircraft flyover noise and, if less disturbing, whether this would be subjectively appreciated by the sleeping individual. The results indicate that a reduction of 15 dB (A) does result in less sleep disruption but only during sleep characterized by fast-wave electroencephalographic activity. During sleep characterized by slow-wave electroencephalographic activity, such a reduction in the sleep-disturbing properties of jet aircraft noise has little effect. Moreover, even when effective during fast-wave sleep, the decreased arousal produced by the lower noise levels is not subjectively appreciated by the individual in terms of his estimate of the quality of his night's sleep. Thus, reducing the overall noise level of jet aircraft flyovers by some 15 dB(A), is, at best, minimally beneficial to sleep. (Author)

A77-42135 Voluntary eye movements and alcohol. J. Levett and G. Hoeft (Rush-Presbyterian-St. Luke's Medical Center, Chicago, Ill.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 612-614. 6 refs. Grant No. PHS-1-R01-AA-02156-01.

Human voluntary horizontal eye-movements are studied prior and subsequent to the ingestion of alcohol. Such movements are important, especially during reading and driving. Infrared monitoring techniques were employed to record eye movements and eye-movement latency histograms were tabulated. Blood alcohol levels were continually monitored. Alcohol increases eye-movement latency but the maximum latency occurred in most cases at different elapsed times from the time of maximum blood alcohol level. In general, a roughly 20% increase in latency occurs subsequent to alcohol. Whether this added delay is a result of a general depression of the oculomotor system or a specific increase in some oculomotor computing element is unresolved. Within the limits of our experimentation, there was no difference between latency change observed in moderate and heavy drinkers. (Author)

A77-42136 Sleep at altitude. J. C. Miller and S. M. Horvath (California, University, Santa Barbara, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 615-620. 23 refs. Grant No. AF-AFOSR-73-2455.

The effects of hypobaric hypoxia upon the electrophysiologically assessed sleep of four male and four female subjects - 18-29 years old - were measured during two successive nights at 493 torr (3500 m) in a hypobaric chamber. Five subjects experienced varied levels of acute mountain sickness (AMS). Sleep disturbance was primarily manifested as 'insomnia' in two subjects experiencing higher levels of AMS. Relatively normal amounts of synchronized sleep were observed at 493 torr, implying the occurrence of sleep hypoventilation. (Author)

A77-42137 Cardiac output during sleep at altitude. J. C. Miller and S. M. Horvath (California University, Santa Barbara, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 621-624. 13 refs. Grant No. AF-AFOSR-73-2455.

The effects of hypobaric hypoxia and sleep, assessed by EEG, upon cardiac output (Q) were studied by impedance cardiography using two male and two female subjects. Three nights were spent at 746 torr (152 m) followed by two nights at 493 torr (3500 m), all in a hypobaric chamber. Relatively normal sleep was observed except in the presence of Acute Mountain Sickness (AMS). The occurrence of normal levels of synchronized sleep implied that sleep hypoventilation occurred. A nadir of Q was observed at about 0500 hours, implying reduced O2 delivery. It was suggested that hypobaric hypoxia, sleep hypoventilation, and reduced O2 delivery may have interacted to produce AMS. (Author)

A77-42138 Accidental hypothermia - An experimental study of practical rewarming methods. M. L. Collis (Victoria, University, Victoria, British Columbia, Canada), A. M. Steinman (U.S. Coast Guard, Air Station, Astoria, Ore.), and R. D. Chaney (U.S. Naval Regional Medical Center, Bremerton, Wash.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 625-632. 51 refs.

Five rewarming techniques, appropriate for first-aid use in the nonhospital setting, were applied to each of nine subjects whose body temperatures had been lowered to 35 C in a stirred tank of 7.5 C water. The rewarming techniques were: (1) inhalation of heated, water-saturated oxygen; (2) placement of heating pads over areas of high heat transfer; (3) combination of methods (1) and (2); (4) hot whirlpool bath; and (5) shivering. Inhalation of heated, water-saturated oxygen was significantly better than the shivering control in minimizing temperature 'afterdrop' and is, therefore, preferred over the other techniques as it avoids the physiological hazards of the peripheral vasodilation from external rewarming. (Author)

A77-42139 * Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol. M. Chavarri, A. Ganguly, J. A. Luetscher, and P. G. Zager (Stanford University, Stanford, Calif.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 633-636. 15 refs. Grant No. NGR-05-020-456.

Previous studies of normal men after 5 d of bedrest showed that circulatory instability on head-up tilt or standing is preceded by increased plasma renin activity (PRA) at bedrest. In the present study, the circadian rhythms of PRA, aldosterone, and cortisol have been observed in five normal men on a constant diet. In ambulatory controls, PRA and aldosterone increased normally after standing. On the third morning of bedrest, PRA was higher than before, and at noon, PRA was higher than in standing controls. The nocturnal peaks of PRA resulting from episodic renin secretion during sleep were higher after bedrest. Plasma aldosterone was also increased by bedrest. The findings are compatible with the theory that intermittent beta-adrenergic nerve activity during sleep is increased after

bedrest, but other factors, such as loss of body sodium and a lower plasma volume, may also be involved. (Author)

A77-42140 Thermal data from helicopters operating in a sub-arctic environment. C. Higenbottam, P. Marcus, and J. Waddell (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 640-644.

Using automatic and observer-operated equipment for monitoring thermal data, observations have been made during Royal Navy Wessex 5 helicopter operations in a sub-Arctic climate. Measurements were taken in flight of front and rear cabin temperatures and aircrew deep body and skin temperatures. The results indicate that the 'arcticised' aircraft used had more than enough cabin heating to alleviate cold stress on the aircrew. (Author)

A77-42141 Effects of hyperoxia on glutathione reductase activity, membrane proteins, and esterases of rabbit erythrocytes. L. E. Ray and J. P. Cherry (Texas A & M University, College Station, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 649-653. 33 refs. Research supported by the Robert A. Welch Foundation; Contract No. F41609-72-C-0003.

A77-42142 Inefficiency of sanitation measures aboard commercial aircraft - Environmental pollution and disease. R. Kikuchi (Tokyo International Airport Dispensary, Tokyo, Japan). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 654-658. 6 refs.

A77-42143 Review of epidemiology in clinical cardiology. V. F. Froelicher, Jr. (USAF, Wilford Hall Medical Center, Lackland AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 659-664. 60 refs.

The importance of using computer technology when applying epidemiological techniques to clinical cardiology is stressed. Epidemiological studies have led to advances in the diagnosis and treatment of coronary atherosclerosis; these advances are reviewed. Investigations on risk and prognosis are also surveyed. It is suggested that the use of computers has lagged in the study of medical problems. M.L.

A77-42144 Organization and operation of civil aviation medicine in the Soviet Union. S. R. Mohler (FAA, Aeromedical Applications Div., Washington, D.C.). *Aviation, Space, and Environmental Medicine*, vol. 48, July 1977, p. 665-667.

Aspects of the civil aviation medicine program in the Soviet Union are discussed. Preflight physical examinations for aircrew members, including flight attendants, quarterly physical examinations on pilots and flight engineers, and a special central hospital for diagnosis and treatment of problem medical cases occurring in aviation personnel are described. Other topics include the prophylactoria (special rest facilities) for the flight crew, preflight examinations on all children, and the provision at each airport of a designated medical emergency facility. M.L.

A77-42180 Thyroid cold acclimation influences on norepinephrine metabolism in brown fat. D. R. Kennedy, R. P. Hammond, and M. W. Hamolsky (Rhode Island Hospital; Brown University, Providence, R.I.). *American Journal of Physiology*, vol. 232, June 1977, p. E565-E569. 34 refs. Research supported by the Rhode Island Hospital Fund for Basic Research and Sergei Zlinkoff Fund for Medical Education and Research.

A77-42181 Neural control of glycogen content and its diurnal rhythm in mouse pineal cell. T. Kachi (Asahikawa Medical College, Asahikawa, Japan) and T. Ito (Hokkaido University, Sapporo, Japan). *American Journal of Physiology*, vol. 232, June 1977, p. E584-E589. 38 refs. Ministry of Education of Japan Grants No. 977001; No. 977023.

A77-42182 Ejection pressure and the diastolic left ventricular pressure-volume relation. J. S. Janicki and K. T. Weber (Pennsylvania, University, Philadelphia, Pa.). *American Journal of Physiology*, vol. 232, June 1977, p. H545-H552. 29 refs. Grants No. NIH-HL-08805; No. NIH-HL-11310; No. NIH-HL-00187.

A77-42183 K-42 exchange during myocardial ischemia. K. I. Shine, A. M. Douglas, and N. Ricchiuti (California, University, Los Angeles, Calif.). *American Journal of Physiology*, vol. 232, June 1977, p. H564-H570. 20 refs. Research supported by the Anna Borun and Harry Borun Foundation and Castera Foundation; Grants No. PHS-HE-05909-01; No. PHS-HE-11074-05.

K-42 exchange was investigated before and after total ischemia in isolated blood-perfused rabbit interventricular septa at 37 C and 72 beats/min. Seven of ten septa showed an increase in K-42 counts on reperfusion. The decreases in muscles of K-42 during reperfusion and in septa during washing out after various periods of ischemia are described. No persistent impairment in Na pump activity for 30 - 45 min of total ischemia was found. After ischemia for 45 min or less there was no consistent relationship between recovery of mechanical function and preservation of K-42 content. After 60 min of ischemia, irreversible mechanical injury was associated with loss of tissue potassium. M.L.

A77-42184 Autoradiographic measurement of regional blood flow in normal and ischemic myocardium. P. M. Malsky, P. S. Vokonas, S. J. Paul, S. L. Robbins, and W. B. Hood, Jr. (Boston City Hospital; Boston University, Boston, Mass.). *American Journal of Physiology*, vol. 232, June 1977, p. H576-H583. 30 refs. Research supported by the American Heart Association; Grants No. PHS-NHLI-14646; No. PHS-NHLI-71-2498; No. PHS-HE-07299.

The autoradiographic method of Reivich and coworkers (1969) was adapted to study regional blood flow in canine hearts. This technique involves a timed infusion of C-14-labeled antipyrine into the experimental animal and subsequent sectioning of the tissue for the preparation of macroautoradiograms, and provides a continuous graphic representation of blood flow indicator from which quantitative measurements of regional blood flow were obtained. Data on myocardial blood flow and the effects of ischemia produced by ligation of the left circumflex coronary artery are provided. M.L.

A77-42185 Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade. M. A. Pfeffer, J. M. Pfeffer, A. K. Weiss, and E. D. Frohlich (Oklahoma University, Oklahoma City Okla.; Alton Ochsner Medical Foundation, New Orleans, La.). *American Journal of Physiology*, vol. 232, June 1977, p. H639-H644. 25 refs. Research supported by U.S. Veterans Administration Hospital.

Spontaneously hypertensive (SHR) and Wistar-Kyoto (WKY) rats were treated with either propranolol or timolol, which are beta-adrenergic receptor inhibiting drugs, from conception until 12 weeks of age to determine whether this procedure would alter the development of systemic hypertension or left ventricular hypertrophy. The heart rates of beta-adrenergic receptor inhibited WKY and SHR rats were consistently reduced with respect to their respective tap-water controls, but this treatment did not alter body growth. Although reduced central venous pressure, cardiac index, and maximum acceleration of aortic flow were detected in the rats receiving drugs, the arterial pressure of the treated rats and the degree of left ventricular hypertrophy of the SHR were unaltered by treatment. M.L.

A77-42186 Fastigial nucleus and orthostatic reflex in cat and monkey. T. F. Huang, M. B. Carpenter, and S. C. Wang (Columbia University, New York, N.Y.). *American Journal of Physiology*, vol. 232, June 1977, p. H676-H681. 32 refs. Research supported by the National Science Council of Nationalist China; Grants No. NIH-HL-12738; No. NIH-NS-00031; No. NIH-NS-01538; No. NIH-NS-01573.

Arterial blood pressure, mean arterial pressure, and the heart rate were monitored in cats and monkeys which were maintained in a head-up tilt to 75 deg for a period of one minute both before (while anesthetized) and after destruction of the fastigal nucleus. The tilt

test was performed immediately following the bilateral lesioning of the rostral fastigial nucleus by thermocoagulation with the aid of a stereotaxic instrument, and the test was repeated six days after the operation. The monkeys and most of the cats recovered normal orthostatic cardiovascular responses after six days. The blood pressure response to bilateral carotid artery occlusion and the responsiveness to electrical stimulation of the vasomotor area in the medulla are discussed. M.L.

A77-42187 Interaction of aortic pressure and left ventricular end-diastolic pressure in the dog. J. R. Foster, E. R. Powers, and W. J. Powell, Jr. (Massachusetts General Hospital; Harvard University, Boston, Mass.). *American Journal of Physiology*, vol. 232, June 1977, p. H697-H704. 16 refs. Grants No. NIH-HL-14292; No. NIH-HL-13435; No. NIH-HL-5196; No. PHS-1-PO1-HL-18646; No. PHS-43-67-1443.

Fiber length (preload) is an important determinant of left ventricular performance. Mean aortic blood pressure also influences ventricular performance. The present study was undertaken to examine the influence of mean aortic pressure on the fiber length-ventricular performance relationship. Fifteen anesthetized, adrenergically blocked dogs were studied on right-heart bypass at constant heart rate and coronary blood flow. An increase in mean aortic pressure permitted a greater improvement in performance as evaluated by stroke work for a given increase in left ventricular end-diastolic pressure. A given increase in mean aortic pressure at a constant stroke volume produced a greater rise in stroke work over intermediate ranges of left ventricular end-diastolic pressure than occurred with higher or lower left ventricular end-diastolic pressure. Thus, the degree of afterload-induced performance improvement depended on the magnitude of the preload. External circumference-left ventricular end-diastolic pressure data suggested a possible relationship between isovolumic systolic circumferential expansion and the improvement of ventricular performance at higher mean aortic pressures. (Author)

A77-42188 Capillary supply of skeletal muscle fibers in untrained and endurance-trained men. P. Brodal, F. Ingjer, and L. Hermansen (Oslo, Universitetet; Institute of Work Physiology; Norwegian College of Physical Education and Sport; Norwegian Armed Forces, Joint Medical Services, Oslo, Norway). *American Journal of Physiology*, vol. 232, June 1977, p. H705-H712. 31 refs.

A77-42239 * Effect of evaporative surface cooling on thermographic assessment of burn depth. V. J. Anselmo (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.) and B. E. Zawacki (Southern California, University, Medical Center, Los Angeles, Calif.). *Radiology*, vol. 123, May 1977, p. 331, 332. 9 refs. Research supported by the AGA Corp.; Contract No. NAS7-100.

Differences in surface temperature between evaporating and nonevaporating, partial- and full-thickness burn injuries were studied in 20 male, white guinea pigs. Evaporative cooling can disguise the temperature differential of the partial-thickness injury and lead to a false full-thickness diagnosis. A full-thickness burn with blister intact may retain enough heat to result in a false partial-thickness diagnosis. By the fourth postburn day, formation of a dry eschar may allow a surface temperature measurement without the complication of differential evaporation. For earlier use of thermographic information, evaporation effects must be accounted for or eliminated. (Author)

A77-42394 Left precordial isopotential mapping during supine exercise. D. M. Mirvis, F. W. Keller, Jr., J. W. Cox, Jr., D. G. Zettergren, R. F. Dowdie, and R. E. Ideker (Tennessee, University, Memphis, Tenn.). *Circulation*, vol. 56, Aug. 1977, p. 245-252. 37 refs. Grants No. NIH-HL-01362; No. NIH-HL-09495.

The pathogenesis of junctional depression was studied in 15 normal volunteers during supine, bicycle ergometer, submaximal stress tests. Electrocardiograms were simultaneously recorded from 42 electrodes on the left anterior precordium at two minute intervals at rest and during exercise, and isopotential maps throughout the P-QRS-T intervals were constructed. At rest, maps throughout the ST segment were dominated by a single maximum along the upper left sternal border. During exercise, all subjects developed junctional depression that was maximal along the lower left sternal border. Exercise maps during the early to mid-ST segment showed an intense minimum along the lower left sternal border that was continuous with terminal QRS forces in both intensity and location. Later in ST, this minimum decreased in strength and was replaced by a maximum located in the same area as that observed at rest. These observations suggest that junctional depression is the result of competition between two effects, one being normal repolarization which is obscured in the early ST segment by the second, possibly representing delayed terminal depolarization forces. (Author)

A77-42395 Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries. W. L. Henry, B. J. Maron, and J. M. Griffith (National Institutes of Health, National Heart, Lung and Blood Institute and Biomedical Engineering and Instrumentation Branch, Bethesda, Md.). *Circulation*, vol. 56, Aug. 1977, p. 267-273. 43 refs.

A77-42396 Echocardiographic assessment of a normal adult aging population. G. Gerstenblith, J. Frederiksen, F. C. P. Yin, N. J. Fortuin, E. G. Lakatta, and M. L. Weisfeldt (National Institutes of Health, National Institute of Aging; Baltimore City Hospitals; Johns Hopkins Medical Institutions, Baltimore, Md.). *Circulation*, vol. 56, Aug. 1977, p. 273-278. 46 refs.

Echocardiograms were performed on 105 male participants in the National Institute on Aging's volunteer Longitudinal Study Program. All subjects (25-84 years of age) were physically active and had no evidence of hypertension or cardiovascular disease. Measurements were made of the initial diastolic (E-F) slope of the anterior mitral valve leaflet, the aortic and left ventricular cavity dimensions, and the thickness of the posterior left ventricular wall. Fractional shortening of the minor semi-axis of the left ventricle and the velocity of circumferential fiber shortening were also determined. It was found that increasing age correlated with a decreased mitral valve E-F slope and increased aortic root diameter and left ventricular wall thickness. Aging did not affect left ventricular cavity dimension, fractional shortening of the minor semi-axis, and velocity of circumferential fiber shortening. These findings suggest that aging in the normal male is associated with altered left ventricular diastolic filling, increased aortic root diameter and left ventricular hypertrophy but little change in contractile ability in the resting state. (Author)

A77-42397 Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography. H. Matsukubo, T. Matsuura, N. Endo, J. Asayama, T. Watanabe, K. Furukawa, H. Kunishige, H. Katsume, and H. Ijichi (Kyoto Prefectural University of Medicine, Kyoto, Japan). *Circulation*, vol. 56, Aug. 1977, p. 278-284. 14 refs.

The feasibility of measuring the thickness of the right ventricular wall by subxiphoid echocardiography was investigated. A group of 96 patients, including normal subjects and patients with left ventricular pressure overload, right ventricular overload, or combined overload was studied. Adequate visualization of the right ventricular wall was possible in 90.6% of the cases. The thickness of the right ventricular wall was found to increase in patients with right ventricular pressure overload without significant increases in the right ventricular dimension index. Thirty-two patients underwent diagnostic right heart catheterization; a good correlation was demonstrated between the right ventricular peak systolic pressure and the right ventricular wall thickness as determined by echocardiography. C.K.D.

A77-42405 Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats (Etudes des effets de NO, NO2, SO2 et de leurs associations sur le rat). G. Maffiolo, Y. Leriquier (Electricité de France, Direction des Etudes et Recherches, Chatou, Yvelines, France), and G. Mancel (Electricité de France, Direction

des Etudes et Recherches, Paris, France). *Pollution Atmosphérique*, vol. 19, Apr.-June 1977, p. 155-160. 20 refs. In French.

An experimental procedure is described for studying the effects of pollutant gases on rats. The experimental chamber is examined in detail with attention to the problem of determining the ambient concentrations of introduced gases. Gas analysis techniques are discussed. It is suggested that SO2 concentrations be measured in both the ingoing and outgoing gas mixtures from the experimental chamber. M.L.

A77-42413 Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients. A. Ch. Simon, M. E. Safar, Y. A. Weiss, G. M. London, and P. L. Milliez (Hôpital Broussais, Paris, France). *British Heart Journal*, vol. 39, July 1977, p. 799-805. 29 refs.

A77-42444 * Event-related brain potentials - Comparison between children and adults. E. Courchesne (California, University, La Jolla, Calif.). *Science*, vol. 197, Aug. 5, 1977, p. 589-592. 14 refs. Grants No. PHS-R01-MH-25594; No. NGR-05-009-003.

The reported investigation shows that nontarget stimuli which are infrequently presented and deviate from the background elicit Nc and Pc waves in children. The same stimuli elicit P3 waves in adults. The scalp distribution of P3 waves in adults appears to vary with the ease of stimulus recognition or the degree of stimulus novelty. However, the Nc and Pc distributions in children do not seem to vary with these factors. The differences between children and adults in event-related potentials suggest corresponding differences in the mode of processing employed by each when rare, deviant stimuli are encountered. G.R.

A77-42567 Numerical prediction of head/neck response to shock-impact. J. C. Huston (Iowa State University of Science and Technology, Ames, Iowa), C. E. Passerello, and R. L. Huston (Cincinnati, University, Cincinnati, Ohio). In: Measurement and prediction of structural and biodynamic crash-impact response; Proceedings of the Winter Annual Meeting, New York, N.Y., December 5-10, 1976. (A77-42564 20-39) New York, American Society of Mechanical Engineers, 1976, p. 137-150. 33 refs. Contract No. N00014-76-C-0139; Grant No. NIH-1-NS-42302.

A three-dimensional, 54 degree of freedom computer model of the head/neck system is presented. The model consists of a series of rigid bodies representing the bones and vertebrae together with springs and dampers representing the muscles, discs, ligaments, and joints. Equations of motion are written for the model by using Lagrange's form of d'Alembert's principle. Computer algorithms are developed to numerically calculate the coefficients of these equations. The governing equations are then integrated numerically for a number of specific cases. The results agree very well with experimental data. (Author)

A77-42865 Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat. B. Schneider (Columbia University, New York, N.Y.; Toronto, University, Toronto, Canada), D. C. Hood, H. Cohen, and M. Stampfer (Columbia University, New York, N.Y.). *Vision Research*, vol. 17, no. 7, 1977, p. 799-806. 23 refs. Research supported by the National Research Council; NSF Grant No. GB-36211.

Behavioral thresholds for a 510 nm light were determined using a signal detection task for rats deprived of vitamin A (experimental group) and compared to behavioral thresholds for rats receiving vitamin A (control group). Simultaneously, rhodopsin content was determined for a separate pair of experimental and control group rats. Visual sensitivity (measured behaviorally) declined with rhodopsin loss. The loss of visual sensitivity (measured behaviorally) as a function of rhodopsin depletion was more similar to the loss (measured electrophysiologically) by Dowling and Wald (1958, 1960) following vitamin A deprivation in rats than to the loss (measured behaviorally) during dark adaptation following intense lights in man. (Author)

A77-42866 Increment spectral sensitivities of the primate late receptor potential and b-wave. D. van Norren and W. S. Baron (Stanford Research Institute, Menlo Park, Calif.). *Vision Research*, vol. 17, no. 7, 1977, p. 807-810. 18 refs. Research supported by the Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek; Grant No. NIH-EY-01579.

Color processing in the most distal portions of the retina was investigated in cynomolgus macaques by recording the local electroretinogram with an intraretinal microelectrode. The spectral sensitivities of the late receptor potential and b-wave were measured on a 4000 td background. The spectral sensitivity function of the late receptor potential differed significantly from that reported in previous studies (Stiles and Crawford, 1933; Sperling and Harwerth, 1971). B-wave sensitivity peaked at 460, 540, and 600 nm. Analysis of the spectral sensitivity of local electroretinogram components reveals different degrees of chromatic interaction at different levels of the retina. Results indicate a summation of receptor potentials in the initial peak of their response and substantial elaboration of the different cone outputs at the bipolar cell level where the b-wave is generated. C.K.D.

A77-42867 Visual capacities of the owl monkey /Aotus trivirgatus/. I - Spectral sensitivity and color vision. II - Spatial contrast sensitivity. G. H. Jacobs (California, University, Santa Barbara, Calif.). *Vision Research*, vol. 17, no. 7, 1977, p. 811-825. 37 refs. NSF Grant No. BNS-74-02621A02; Grant No. NIH-EY-00105.

A77-42868 Detection and discrimination of simple and complex patterns at low spatial frequencies. C. S. Furchner (Princeton University, Princeton, N.J.), F. W. Campbell (Cambridge University, Cambridge, England), and J. P. Thomas. *Vision Research*, vol. 17, no. 7, 1977, p. 827-836. 17 refs. Grant No. PHS-EY-00360.

The extent to which low spatial frequencies are processed independently was assessed. The ability of subjects to detect and discriminate simple and complex low frequency patterns containing harmonic components of approximately equal visibilities was investigated. Results indicate that if the components of a pattern are sufficiently widely spaced (at frequency ratios of more than 3:1) that each activates a different channel, they are processed independently as suggested by Campbell and Robson (1968). However, if components are so closely spaced that important ones activate common channels, a breakdown in independent processing occurs. C.K.D.

A77-42869 Is perceived length affected by interactions between orientation detectors. T. Caelli (Melbourne, University, Parkville, Victoria, Australia). *Vision Research*, vol. 17, no. 7, 1977, p. 837-841. 14 refs.

Illusions of length are known to occur with simple geometric stimuli or shapes related to the constancies of the perceived world. In this experiment illusions of length are also found to occur with complex randomly orientated shapes, unrelated to any constancy structure within the perceived environment. These results also indicate that some length illusions are directly related to the encoding of orientation as some perceived vertical to horizontal extent; and that the magnitude of the illusion may be predicted from known interactions between orientation detectors within the human visual system. (Author)

A77-42870 Hysteresis binocular grating perception - Contrast effects. H. R. Wilson (Chicago, University, Chicago, Ill.). *Vision Research*, vol. 17, no. 7, 1977, p. 843-851. 28 refs.

It is known that when pairs of sinusoidal gratings of slightly different spatial frequencies are viewed stereoscopically, subjects perceive a plane tilted in depth. Here it is shown that if the contrast of one of the gratings is continuously varied in time, abrupt transitions occur between perceptions of a flat and tilted surface. These transitions define a hysteresis loop as a function of contrast. As eye movements cannot account for this effect, binocular contrast hysteresis must be neural in origin. A mathematical model is developed to account for the major aspects of the hysteresis

phenomenon. The key feature of the model is positive feedback among disparity sensitive cells generated by disinhibitory circuits. (Author)

A77-42871 Long-lasting afterimages caused by neural adaptation. V. Virsu and P. Laurinen (Helsinki, University, Helsinki, Finland). *Vision Research*, vol. 17, no. 7, 1977, p. 853-860. 27 refs. Research supported by the Academy of Finland and Finnish National Fund for Research and Development.

If the retinal location of a sinusoidal grating alternates back and forth in half-period steps, the temporal average stimulation is equivalent to that produced by a homogeneous field of light. Adaptation to this stimulus causes strong patterned afterimages, however, and they last longer than 2 min in the dark. The afterimages appear as gratings but at twice the spatial frequency of the adaptation gratings even though only the fundamental frequency is seen during adaptation. The appearance of this illusory grating afterimage indicates that a nonlinear intensity scaling precedes the site of some afterimages, the origin of which is neural and not photochemical. The neural origin was confirmed by the results of various experiments in which the eye was pressure blinded during adaptation. Blinding eliminated all negative afterimages otherwise caused by weakly bleaching primary stimuli but left positive afterimages intact. Two classes of long-lasting afterimages, the 'sensitivity images' and 'bleaching images', are required to explain our results. (Author)

A77-42872 Temporal studies with flashed gratings - Inferences about human transient and sustained channels. B. G. Breitmeyer (Houston, University, Houston, Tex.) and L. Ganz (Stanford University, Stanford, Calif.). *Vision Research*, vol. 17, no. 7, 1977, p. 861-865. 21 refs. Grant No. PHS-EY-01242.

The temporal response characteristics of the human visual system to low and high spatial frequency gratings were investigated using two different presentation techniques. In the first, the threshold contrasts of flashed gratings were measured as a function of length of presentation; in the second, the sensitivity of the visual system to briefly flashed gratings was determined as a function of the temporal interval separating it from a similar presentation of the same grating at a suitably chosen subthreshold contrast value. The subthreshold interaction of two flashes at high spatial frequencies can be characterized by monophasic sustained excitation and inhibition, while interaction at low spatial frequencies can be characterized by a multiphasic oscillation of excitation and inhibition superimposed on a monophasic excitatory-inhibitory interaction. The results indicate fundamental differences between the temporal response patterns of transient and sustained channels. C.K.D.

A77-42873 Psychophysical experiments on spatial summation at threshold level of the human peripheral retina. A. M. W. Scholtes and M. A. Bouman (Utrecht, Rijksuniversiteit, Utrecht, Netherlands). *Vision Research*, vol. 17, no. 7, 1977, p. 867-873. 29 refs. Research supported by the Nederlandse Organisatie voor Zuiver-Weterschappelijk Onderzoek.

A77-42993 Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension. G. Kissling, T. Gassenmaier, M. F. Wendt-Gallitelli, and R. Jacob (Tübingen, Universität, Tübingen, West Germany). *Pflügers Archiv*, vol. 369, no. 3, 1977, p. 213-221. 51 refs. Research supported by the Deutsche Forschungsgemeinschaft.

A77-43005 * On the origin of biological chirality via natural beta-decay. H. P. Noyes, W. A. Bonner, and J. A. Tomlin (Stanford University, Stanford, Calif.). *Origins of Life*, vol. 8, Apr. 1977, p. 21-23. 17 refs. NASA-ERDA-supported research.

An hypothesis to account for the chirality (handedness) of some biological molecules is given. Experimental evidence suggests that longitudinally polarized electrons having the chirality of terrestrial beta-decay electrons remove dextro-leucine from a racemic mixture. If, by a similar mechanism, the terrestrial environment provided more levo- than dextro-amino acids, that would account for the chirality now observed in organic molecules. An isotope of potassium has been proposed as the natural beta-emitter responsible for biomolecular chirality; however, Carbon 14 may be an even more plausible candidate. Ready availability of the carbon isotope in the terrestrial environment of 4.5 aeons ago, and the role of leucine in protein synthesis indicate that these two agents may have been chief factors in the evolution of biomolecular chirality. Suggestions for further research in this area are made. J.M.B.

A77-43006 The role of mineral surfaces in the origin of life. V. A. Otroshchenko and N. V. Vasil'eva (Academy of Sciences, Institute of Biochemistry, Moscow, USSR). *Origins of Life*, vol. 8, Apr. 1977, p. 25-31. 21 refs.

Adsorption of nucleoside phosphates on the surfaces of volcanic rocks has been studied. Differences in the adsorption of some nucleoside phosphates on the surface of basalt cinder have been found. Differences in the adsorption of similar molecules on different mineral surfaces have also been shown. Different adsorptive capacities may have served as a mechanism for the selection of organic molecules during prebiotic evolution. (Author)

A77-43007 A model for a non-chemical form of life - Crystalline physiology. J. Schneider (Meudon, Observatoire, Meudon, Hauts-de-Seine, France). *Origins of Life*, vol. 8, Apr. 1977, p. 33-38. 7 refs.

Using the existence of a central memory as the criterion for defining life, a crystalline physiology is proposed. The central memory of crystals, like that of DNA, would be stable, contain rich information, and be capable of a kind of replication, that is, diffusion of its information into surrounding media. Interlocked dislocation loops found in crystals are cited as likely units in the formation of stable, information-rich structures. Complex chains of interlocking loops, analogous to complex organic molecules, are generated by the Franck-Read mechanism; furthermore, Burger's vector of dislocation can be used to describe a model synthesizing process in which stresses acting on crystalline line dislocations with pinned ends transmit a loop dislocation while leaving the initial line dislocation intact. Mechanical energy required for the processes may be supplied by seismic or tectonic stresses on earth, or by rotational energy and frictional stresses in white dwarfs and neutron stars. J.M.B.

A77-43008 Symbiosis and the origin of life. G. A. M. King (Department of Scientific and Industrial Research, Physics and Engineering Laboratory, Lower Hutt, New Zealand). *Origins of Life*, vol. 8, Apr. 1977, p. 39-53. 29 refs.

The paper uses chemical kinetic arguments and illustrations by computer modelling to discuss the origin and evolution of life. Complex self-reproducing chemical systems cannot arise spontaneously, whereas simple autocatalytic systems can, especially in an irradiated aqueous medium. Self-reproducing chemical particles of any complexity, in an appropriate environment, have a self-regulating property which permits long-term survival. However, loss of materials from the environment can lead to continuing decay, which is circumvented by physical union between different kinds of self-reproducing particles. The increasing complexity produced by such unions (symbioses) is irreversible, so that the chemical system evolves. It is suggested that evolution by successive symbioses brought about the change from simple spontaneously arising autocatalytic particles to complex prokaryotic cells. (Author)

A77-43016 * Effects of increased gravity force on nutations of sunflower hypocotyls. A. H. Brown and D. K. Chapman (Pennsylvania, University, Philadelphia, Pa.). *Plant Physiology*, vol. 59, 1977, p. 636-640. 17 refs. Grants No. NGR-39-010-104; No. NGR-39-010-149; No. NGR-39-030-010; Contracts No. NAS2-2432; No. NAS2-7730; No. NASw-2208.

A centrifuge was used to provide sustained acceleration in order to study the hypocotyl nutation of 6-day-old Helianthus annuus L. over a range of g-forces, up to 20 times normal g. At the upper end of this g-range, nutation was impeded and at times was erratic

evidently because the weight of the cotyledons exceeded the supportive abilities of the hypocotyls. Over the range 1 to 9 g, the period of nutation was independent of the resultant force vector. Over the same g-range, the amplitude of nutation was nearly independent of the chronic g-force. If nutation in sunflower seedlings is an oscillation caused by a succession of geotropic responses which continue to overshoot the equilibrium position (plumb line), its amplitude might be expected to be more sensitive to changes in magnitude of the sustained g-force. In order to preserve the geotropic model, in which nutation is considered to be a sustained oscillation driven by geotropic reactions, it is necessary to assume that geotropic response must increase with increasing g most rapidly in the region of the g-parameter below the terrestrial value of 1 g. (Author)

A77-43177 # A survey of piloting factors in fixed-wing V/STOL aircraft. R. F. Ringland and S. J. Craig (Systems Technology, Inc., Hawthorne, Calif.). In: Atmospheric Flight Mechanics Conference, Hollywood, Fla., August 8-10, 1977, Technical Papers. (A77-43151 20-08) New York, American Institute of Aeronautics and Astronautics, Inc., 1977, p. 239-246. 44 refs. Contract No. N60530-76-C-0216. (AIAA 77-1147)

This paper summarizes the key results of a recently completed review of the available literature pertaining to piloting factors in fixed-wing V/STOL aircraft design. It emphasizes mission- and vehicle-related factors which are peculiar to the V/STOL concept and which determine the control/display system requirements. The review shows excessive pilot workload originating primarily in the control aspects of the aircraft to be the central problem in past designs. These aspects include management of the propulsion/lift systems during conversion, stabilization of vehicle attitude, and the stabilization and control of the aircraft's speed and path angle responses. Results show display technology improvements alone cannot solve these piloting problems without control augmentation because the pilot's capability remains overtaxed. (Author)

A77-43279 Parametric optimization in the problem of biped locomotion. V. V. Beletskii and P. S. Chudinov. *(Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela,* vol. 12, Jan.-Feb. 1977, p. 25-35.) *Mechanics of Solids,* vol. 12, no. 1, 1977, p. 22-31. 7 refs. Translation.

A semi-inverse method is used to analyze the dynamics of a two-legged walking machine. Part of the generalized coordinates is given in the form of explicit functions of time, while the remainder of the kinematic and dynamic variables is determined from the nonlinear differential equations of motion. Some problems of walking are submitted to parametric optimization, as a result of which optimal machine configurations, minimizing energy consumption, are determined. B.J.

A77-43325 # New trends in phonocardiograph modulators. Z. Mack and Z. Opletal (TESLA, Electronics Research Institute, Prague, Czechoslovakia). *TESLA Electronics,* vol. 10, June 1977, p. 35-44. 5 refs.

The performance and electrical design of a portable phonocardiograph modulator facilitating an optimum engineering solution for clinical practice are described. Various designs of modulator are compared, in particular ring modulators and cross modulators. Transmission of the modulating signal and manipulation of the switching signal are compared. The modulator developed features printed circuitry with discrete circuit components and transistors, with low power drain; it is viewed as a prototype for subsequent development of a pocket-size format with IC. R.D.V.

A77-43641 * Robots and manipulator systems; Proceedings of the Second Conference on Remotely Manned Systems, Los Angeles, Calif., June 9-11, 1975. Conference sponsored by the University of Southern California, Human Factors Society, and NASA. Edited by E. Heer (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Mechanism and Machine Theory,* vol. 12, no. 1, 1977. 135 p. (For individual items see A77-43642 to A77-43649)

Attention is given to supervisory control of remote manipulation, an automatic device for measuring viscoelasticity, adaptable programmable assembly systems for teleoperator applications, and proximity sensor technology for manipulator end effectors. Also considered are control and stability problems of remote orbital capture, orbital servicing and remotely manned systems, gray-level transformations for interactive image enhancement, and the design of a three-fingered hand. B.J.

A77-43642 An investigation of supervisory control of remote manipulation. D. E. McGovern (Sandia Laboratories, Albuquerque, N. Mex.). *(Conference on Remotely Manned Systems, 2nd, Los Angeles, Calif., June 9-11, 1975.) Mechanism and Machine Theory,* vol. 12, no. 1, 1977, p. 3-9. 6 refs. ERDA-supported research.

Various types and levels of computer assistance in manipulation are discussed and the requirements for modeling of supervisory control are identified. A simple supervisory control computer program for manipulator operation is described and, using results from manual control experimentation and modeling of the computer program, an estimate of system performance is given. (Author)

A77-43643 Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications. J. L. Nevins and D. E. Whitney (Charles Stark Draper Laboratory, Inc., Cambridge, Mass.). *(Conference on Remotely Manned Systems, 2nd, Los Angeles, Calif., June 9-11, 1975.) Mechanism and Machine Theory,* vol. 12, no. 1, 1977, p. 27-43. 16 refs. NSF Grants No. ATA-74-18173; No. GI-39432X.

This paper discusses three aspects of teleoperator research and development at Draper Lab: early - teleoperator-oriented creation of new system architecture, and new control and sensor modes; current - industrially oriented work on mechanical assembly based on combining the teleoperator work with thorough analyses of tasks, information, control and technological sophistication; and finally - some recommendations for structuring future research programs for teleoperator system development based on applying the above research results to new and challenging applications. (Author)

A77-43644 * Control and stability problems of remote orbital capture. M. H. Kaplan and A. A. Nadkarni (Pennsylvania State University, University Park, Pa.). *(Conference on Remotely Manned Systems, 2nd, Los Angeles, Calif., June 9-11, 1975.) Mechanism and Machine Theory,* vol. 12, no. 1, 1977, p. 57-64. Grants No. NGR-39-009-162; No. NsG-7078.

Certain space shuttle missions may require retrieval of passive spinning and precessing satellites. One proposed means of retrieval utilizes a free-flying teleoperator launched from the shuttle. A study of misalignment, stability, and certain control aspects during capture of an object is reported here. The approach used is to model the dynamics by a Lagrangian formulation and apply torque components to dissipate motion. Differential angular rates between teleoperator and object are assumed, and control responses after capture are reviewed. (Author)

A77-43646 * The LEMMA concept - A new manipulator. L. Kersten. *(Conference on Remotely Manned Systems, 2nd, Los Angeles, Calif., June 9-11, 1975.) Mechanism and Machine Theory,* vol. 12, no. 1, 1977, p. 77-84. 8 refs. Contract No. NAS8-31897.

The LEMMA is a proposed conceptual design of a remote teleoperator manipulator arm with 6 degrees of freedom, exclusive of the end-effector. The bevel gear arrangement in 4 of the 6 degrees of freedom, together with the concentric-tubular arm configuration, requires a unique and novel drive mechanism. This differential drive assembly, housed in the shoulder, is a self-compensating device and simplifies the matrix solution for the resolved motion rate control system needed to guide the arm in its performances. The article will describe the need for the 6 degrees of freedom as established by the work envelope, the functioning of the differential shoulder drive, the arm and joint configuration, and the anticipated degree of accuracy. (Author)

A77-43647 * Design for a three-fingered hand. F. R. E. Crossley (Massachusetts, University, Amherst, Mass.). *(Conference on Remotely Manned Systems, 2nd, Los Angeles, Calif., June 9-11, 1975.) Mechanism and Machine Theory*, vol. 12, no. 1, 1977, p. 85-93. 11 refs. Contract No. NAS8-29073.

This paper describes the construction of a prototype mechanical hand or 'end effector' for use on a remotely controlled robot, but with possible application as a prosthetic device. An analysis of hand motions is reported, from which it is concluded that the two most important manipulations (apart from grasps) are to be able to pick up a tool and draw it into a nested grip against the palm, and to be able to hold a pistol-grip tool such as an electric drill and pull the trigger. One of our models was tested and found capable of both these operations. (Author)

A77-43648 * Proximity sensor technology for manipulator end effectors. A. R. Johnston (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *(Conference on Remotely Manned Systems, 2nd, Los Angeles, Calif., June 9-11, 1975.) Mechanism and Machine Theory*, vol. 12, no. 1, 1977, p. 95-109. 14 refs.

Optical proximity sensing devices suitable for hand mounting on a manipulator are described, which use near IR LED light sources operating at 0.94 micron and silicon detectors, with appropriate signal processing so that the data are unaffected by ambient light. Laboratory tests with simple proximity sensors are described. Extension of the same techniques to yield multipoint or digital sensors is also discussed. A cooperative proximity sensor concept is described, which employs a composite mirror attached to the work piece to generate an unambiguous set of position and orientation signals. A very rudimentary experiment in local control of a manipulator with a pair of hand mounted proximity sensors is also described. (Author)

A77-43723 Exercise testing in the diagnosis of coronary heart disease - A perspective. L. R. Zohman (Montefiore Hospital and Medical Center, Bronx, N.Y.) and A. A. Kattus (California, University, Los Angeles, Calif.). *American Journal of Cardiology*, vol. 40, Aug. 1977, p. 243-250. 36 refs.

The methods of assessing the diagnostic usefulness of exercise testing in detecting coronary obstructive disease are examined. The limitations of long-term clinical follow-up and coronary angiography as standards for the determination of disease are described as are the effects of test methodology, criteria for positivity, prevalence of disease in the study population, reliability of the standard and recognition of false positive and false negative results in determining reliability of such testing. High values were found for sensitivity and specificity for exercise testing of patients with coronary artery disease referred for consultation to medical center cardiology services. Maximal exercise testiog and consideration of symptomatic and hemodynamic as well as electrocardiographic criteria for identification of myocardial ischemia are helpful in improving reliability. Diagnostic accuracy is greatly enhanced by recognition of known causes for false positive and false negative results. (Author)

A77-43724 Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations. *American Journal of Cardiology*, vol. 40, Aug. 1977, p. 260-268.

A77-43725 Diagnosis of myocardial infarction - Historical notes from the Soviet Union and the United States. J. E. Muller (Peter Bent Brigham Hospital; Harvard University, Boston, Mass.). *American Journal of Cardiology*, vol. 40, Aug. 1977, p. 269-271. 6 refs.

Contributions made in the first two published articles describing the clinical presentation of nonfatal myocardial infarction are outlined. The first article on the topic, written in 1910 by the Russian physicians Obraztov and Strazhesko, presents five cases of myocardial infarction, three of which were confirmed by autopsy. On the basis of these case studies, these authors identified the clinical symptoms of myocardial infarction as substernal pain with radiation to the neck, head and left hand, shortness of breath or dyspnea, and a feeling of heaviness and severe pressure in the epigastrium and about the heart. In his article published in 1912, James Herrick described the disease, stimulated the development of the electrocardiogram for its diagnosis, and predicted present interest in limitation of infarct size. C.K.D.

A77-43876 Evaluation and interpretation of the EKG /2nd revised edition/ (Auswertung und Deutung des EKG /2nd revised edition/). A. H. Lemmerz and R. R. Schmidt. Basel, S. Karger AG, 1976. 265 p. In German. $19.

The fundamentals of electrocardiography are considered along with the technical basis for the recording of the electrocardiogram, a description of the normal electrocardiogram, the various positional types of the EKG, the electroatriogram, functional examinations conducted with the aid of the EKG, EKG changes in connection with the myocardial infarct, and EKG changes frequently observed in connection with certain complaint characteristics. Attention is also given to electrical alternans, disturbances of the heart rhythm, EKG studies in the case of patients with heart pacemakers, and a description of form variants observed in connection with various complaints. G.R.

A77-44001 # Modeling of the thermophysical processes accompanying muscle contraction in humans (Modelirovanie teplofizicheskikh protsessov pri sokrashchenii myshts cheloveka). F. A. Krivoshei (Akademiia Nauk Ukrainskoi SSR, Institut Tekhnicheskoi Teplofiziki, Kiev, Ukrainian SSR). In: Heat and mass transfer - V; All-Union Conference on Heat and Mass Transfer, 5th, Minsk, Belorussian SSR, May 17-20, 1976, Proceedings. Volume 9. (A77-43880 20-34) Minsk, AN BSSR Institut Teplo- i Massoobmena, 1976, p. 18-22. In Russian.

A biothermal model consisting of a skeletal muscle covered by functional peripheral layer of skin is examined. A mathematical model describing the interrelationship between the thermophysical and biomechanical phenomena occurring during muscle contraction is proposed. A system of equations describing the temperature distribution in the two-layer biothermal model is derived, assuming a linear temperature dependence of the metabolic heat release. V.P.

A77-44175 Pitfalls and limitations of M-mode echocardiography. M. N. Kotler, B. L. Segal, G. Mintz, and W. R. Parry (Hahnemann Medical College and Hospital, Philadelphia, Pa.). *American Heart Journal*, vol. 94, Aug. 1977, p. 227-249. 156 refs.

Limitations in the sensitivity and specificity of M-mode echocardiography are discussed. Problems in transducer placement, beam angulation and interpretation of echocardiograms in the diagnosis of a variety of conditions are examined. Echocardiography techniques and interpretation of echocardiograms to detect mitral stenosis, mitral regurgitation, rupture of the chordae tendineae, mitral valve prolapse, calcific aortic stenosis, aortic regurgitation, aortic root dissection, pericardial effusion, coronary artery disease, bacterial endocarditis, atrial septal defect, endocardial cushion defect, and other conditions are described. The determination of cavity dimensions and wall thickness is discussed. C.K.D.

STAR ENTRIES

N77-28715# Hawaii Univ., Honolulu. Water Resources Research Center.
ALGA GROWTH POTENTIAL OF WASTE WATER EFFLUENTS IN HAWAIIAN RECEIVING WATERS Final Report, 1 Jul. 1975 - 30 Sep. 1976
Reginald H. F. Young, Eassie M. Miller, and Ivan K. Nakatsuka Nov. 1976 58 p refs
(Contract DI-14-34-0001-6012)
(PB-265172/7; TMR-52; OWRT-A-065-HI(1); W77-05852)
Avail: NTIS HC A04/MF A01 CSCL 13B

A laboratory study was conducted to determine the algal growth potential (AGP) of secondary domestic effluents on stream and marine waters in Hawaii. AGP methods developed by the Environmental Protection Agency were used with effluent-receiving water mixtures representative of nutrient levels found in existing effluent disposal situations. Results of this study are indicative that growth response follows similar patterns for conventional biologically-treated effluents in the four fresh receiving waters tested, with peak growth occurring at a 20% dilution of the effluent. GRA

N77-28716* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORNEAL SEAL DEVICE Patent
Edward F. Baehr, inventor (to NASA) Issued 5 Jul. 1977 7 p Filed 13 Apr. 1976 Supersedes N76-22891 (14 - 13, p 1709)
(NASA-Case-LEW-12258-1; US-Patent-4,033,349; US-Patent-Appl-SN-676433; US-Patent-Class-128-303R; US-Patent-Class-128-1R) Avail: US Patent Office CSCL 06B

A corneal seal device is provided which, when placed in an incision in the eye, permits the insertion of a surgical tool or instrument through the device into the eye. The device includes a seal chamber which opens into a tube which is adapted to be sutured to the eye and serves as an entry passage for a tool. A sealable aperture in the chamber permits passage of the tool through the chamber into the tube and hence into the eye. The chamber includes inlet ports adapted to be connected to a regulated source of irrigation fluid which provides a safe intraocular pressure. Official Gazette of the U.S. Patent Office

N77-28717* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SNAP-IN COMPRESSIBLE BIOMEDICAL ELECTRODE Patent
James D. Frost, Jr. (Methodist Hospital, Houston) and Carl E. Hillman, Jr., inventors (to NASA) (Methodist Hospital, Houston) Issued 5 Jul. 1977 4 p Filed 3 Dec. 1975 Supersedes N76-13735 (14 - 04, p 0488) Sponsored by NASA
(NASA-Case-MSC-14623-1; US-Patent-4,033,334; US-Patent-Appl-SN-637269; US-Patent-Class-128-2.1E; US-Patent-Class-128-410; US-Patent-Class-128-DIG.4) Avail: US Patent Office CSCL 06B

A replaceable, prefilled electrode enclosed in a plastic seal and suitably adapted for attachment to a reusable, washable cap having snaps thereon is disclosed. The apparatus is particularly adapted for quick positioning of electrodes to obtain an EEG. The individual electrodes are formed of a sponge body which is filled with a conductive electrolyte gel during manufacture. The sponge body is adjacent to a base formed of a conductive plastic material. The base has at its center a male gripper snap. The cap locates the female snap to enable the electrode to be positioned. The electrode can be stored and used quickly by attaching to the female gripper snap. The snap is correctly positioned and located by mounting it in a stretchable cap. The cap is reusable with new electrodes for each use. The electrolyte gel serves as the contact electrode to achieve a good ohmic contact with the scalp. Official Gazette of the U.S. Patent Office

N77-28718 Indiana Univ., Bloomington.
THE DYNAMIC FUNCTION OF SELECTED MUSCLES OF THE FOREARM: AN ELECTROMYOGRAPHICAL AND CINEMATOGRAPHICAL ANALYSIS Ph.D. Thesis
Calvin Sabin Fisk 1976 187 p
Avail: Univ. Microfilms Order No. 77-1958

The lateral head of the triceps brachii, flexor carpi ulnaris, flexor carpi radialis, and pronator teres muscles were studied during the performance of the overhand baseball throw. Indwelling differential bipolar fine-wire electrodes were employed to record action potentials produced by these muscles. Seven experienced and five inexperienced subjects each performed two straight throws with spin. Electro-myograms were recorded by an Offner Dynograph and cinematographic data was recorded by a high-speed LOCAM camera at 200-400 frames per second on 16 mm film. The data revealed noticeable differences between the experienced and the inexperienced performers. Experimental percentages were relatively consistent among the experienced performers, whereas the contractions of the inexperienced performers were erratically strong or weak. Experienced performers displayed consistent early contractions during both types of throws. Dissert. Abstr.

N77-28719 Michigan Univ., Ann Arbor.
THE ROLE OF POTASSIUM IN THE CONTROL OF THE CORONARY CIRCULATION: MECHANISM OF ACTION AND TIME COURSE Ph.D. Thesis
Paul Alan Murray 1976 152 p
Avail: Univ. Microfilms Order No. 77-8002

Forty micromole bolus injections of isosmotic KCl into the circumflex artery of the open-chest dog were found to decrease CVR (coronary vascular resistance) from 34 to 48 percent. These injections had no effect on heart rate, and produced small, but significant, decreases in mean arterial pressure and myocardial oxygen consumption. The magnitude of K+-induced vasodilation was not significantly affected by the administration of propranolol, atropine, or phentolamine. However, K+-induced vasodilation was significantly attenuated by ouabain-lidocaine. This inhibitory action seemed to be primarily due to the effects of ouabain, since lidocaine alone did not significantly decrease the magnitude of the vascular response. Dissert. Abstr.

N77-28720 Florida Univ., Gainesville.
AN ANALYSIS OF THE CONTRIBUTION OF SMALL AIRWAYS TO LOWER AIRWAY RESISTANCE Ph.D. Thesis
John Newton Evans 1976 119 p
Avail: Univ. Microfilms Order No. 77-6867

It was shown that the contribution of peripheral airways to lower pulmonary resistance in closed chest dog is significantly greater than that measured following the opening of the chest. The reduction of peripheral resistance is mainly mediated through an increased beta adrenergic receptor stimulation in the peripheral airway. The influence of sympathetic input on the tonus of peripheral airway smooth muscle is minimal in the closed chest dog and only becomes significant when the chest is opened. In spite of the reductions in R sub P, due to opening of the chest there were no significant changes in R sub L which means that central resistance increased in a magnitude equal to the reduction of R sub P. The possiblility of maintenance of a constant R sub L at a given lung volume by coordinated changes in R sub C to offset changes R and L is suggested. Dissert. Abstr.

N77-28722# Aeronautical Research Council, London (England).
AN ANTHROPOMETRIC SURVEY OF 2,000 ROYAL AIR FORCE AIRCREW, 1970/1971

C. B. Bolton (RAE, Farnborough, Engl.), M. Kenward (Loughborough Univ., Engl.), R. E. Simpson (RAE, Farnborough, Engl.), and G. M. Turner (Royal Air Force Inst. of Aviation Medicine, Farnborough, Engl.) 1975 132 p refs Supersedes RAE-TR-73083 and ARC-35030
(ARC-R/M-3772; RAE-TR-73083; ARC-35030; ISBN-0-11-470917-3) Avail: NTIS HC A07/MF A01; HMSO £6.55; PHI

The survey was undertaken to provide up-to-date information on the body measurements of Royal Air Force aircrew. This information is required for cockpit workspace and functional-clothing-sizing studies. A team of two trained measurers, using a specially designed anthropometric rig, took 62 body measurements of each of 2,000 Royal Air Force aircrew between the ages of 18 and 45 at R.A.F. stations in England. The measurements, are summarized in the form of a percentile table, mean, standard deviation, range and coefficient of variation for each measurement. The statistical summary for each measurement is accompanied by a photograph illustrating the technique of measurement together with a written description of the measuring procedure. The apparatus used is fully described and the organization of the survey is briefly discussed. Author

N77-28723# Aeronautical Research Council, London (England).
AN ANTHROPOMETRIC SURVEY OF 500 ROYAL AIR FORCE AIRCREW HEADS, 1972
P. C. Hobbs (RAE, Farnborough, England) 1975 117 p refs Supersedes RAE-TR-73137 and ARC-35084
(ARC-R/M-3773; RAE-TR-73137; ARC-35084; ISBN-0-11-470918-1) Avail: NTIS HC A06/MF A01; HMSO £7.70; PHI

An anthropometric survey of 500 R.A.F. aircrew heads was undertaken. 45 measurements were taken from each subject. Data obtained from these, together with those from 17 derived measurments are presented in the standard percentile table form. The photogrammetric method used will enable other dimensions, if required at a later date, to be measured from the permanent record photographs without recalling the subject. Author

N77-28724# Medical Coll. of Wisconsin, Milwaukee. Dept. of Microbiology.
STABILIZATION STUDIES ON HUMAN INTERFERON Annual Report, Jun. 1975 - Jun. 1976
Sidney E. Grossberg, J. James Sedmak, Helmut Ankel, Patricia Jameson, and Donald Greiff 1 Mar. 1976 36 p
(Contract AI-4-2520)
(PB-264824/4; IDB-ASP-06-188) Avail: NTIS HC A03/MF A01 CSCL 06M

The stability characteristics were determined for a crude human fibroblast interferon preparation. This crude preparation was very stable to mechanical inactivation even under conditions of vigorous agitation. The crude preparation was quite unstable to heating. Low pH and the addition of chaotropic salts enhanced the thermal stability of this liquid preparation. Freeze-drying provided the preparation most resistant to thermal inactivation. Heat-inactived crude fibroblast interferon could be partially reactivated by increasing the hydrogen-ion concentration in conjunction with carefully selected conditions of heating. GRA

N77-28725# United States Testing Co., Inc., Hoboken, N.J. Biological Services Div.
TOXICOLOGICAL AND SKIN CORROSION TESTING OF SELECTED HAZARDOUS MATERIALS Final Report, 1973-1974
Erskine E. Harton, Jr. and Richard R. Rawl Apr. 1976 32 p refs
(Contract DOT-OST-30077)
(PB-264975/4; DOT-MTB-OHMO-76-2) Avail: NTIS HC A03/MF A01 CSCL 06T

Animal tests were performed using selected substances to determine if they qualified as hazardous materials according to the Department of Transportation Hazardous Materials Regulations. Overall toxicological and skin corrosion test results are summarized. The actual test data and details of the test methods used are also included. GRA

N77-28726# Manned Systems Sciences, Inc., Northridge, Calif.
ASSESSMENT OF A PROTOTYPE HUMAN RESOURCES DATA HANDBOOK FOR SYSTEMS ENGINEERING Final Report, Apr. - Dec. 1976
David Meister Dec. 1976 106 p refs
(Contract F33615-76-C-0045; AF Proj. 1124)
(AD-A039269; AFHRL-TR-76-92) Avail: NTIS HC A06/MF A01 CSCL 05/9

This study assessed the effectiveness, utility and acceptability of a prototype human resources (HR) data handbook developed by the Air Force Human Resources Laboratory (AFHRL-TR-75-64, AD-A019 553). Twelve system development problems (representative of those the prototype handbook was designed to solve) were simulated in questionnaire form. Thirty-six engineers used the prototype handbook to solve these problems. They also rated problem difficulty level, their confidence in their solutions, the similarity of the problems presented to those they ordinarily dealt with, the usefulness of the prototype handbook, and the adequacy and accessibility of their own data sources compared to the prototype handbook. Results indicated that system development personnel can use the prototype handbook to significantly improve decision correctness. A substantial percentage of respondents considered the prototype handbook to have moderate or greater utility and potential influence on design. Recommendations for improvement of the prototype handbook were made. The assessment is sufficiently encouraging to warrant continuing the effort to develop HR data handbooks. GRA

N77-28727# Michigan Univ., Ann Arbor.
A PSYCHOPHYSICAL ANALYSIS OF COMPLEX INTEGRATED DISPLAYS
Mary Hardzinski and Robert G. Rachella Feb. 1977 59 p refs
(Contract N00014-76-C-0648)
(AD-A039260; Rept-014523-2-T; TR-59) Avail: NTIS HC A04/MF A01 CSCL 05/8

Five types of complex integrated displays were subjected to multidimensional scaling analyses. The display types were selected to be representative of a variety of characteristics that can result when dimensions are combined in an integrated fashion. These characteristics included perceptual separability, familiarity, emergent properties and perceptual interaction among dimensions. Of primary interest was the question of whether or not the Minkowski scaling metric would be diagnostic or predictive of any of these characteristics, as previous literature had indicated. The results showed that in virtually all cases the Euclidean metric produced better fits than the City-Block metric. GRA

N77-28728# Texas Woman's Univ., Denton.
INTERACTION BETWEEN METHYL MERCURY AND RADIATION EFFECTS ON NERVOUS SYSTEMS
Eugene W. Hupp, Dalton Day, James Hardcastle, John Hines, and James Minnich Jan. 1977 133 p refs
(Contract EPA-R-800282)
(PB-265873/0; EPA-600/1-77-006) Avail: NTIS HC A07/MF A01 CSCL 06T

Parameters evaluated included several measurements of behavior, brain electrical activity, lethality, blood-brain barrier permeability, neurotransmitter and mercury concentration in various brain areas, and brain histology. In some cases the effects of the co-insult were less than or at least no greater than at least one of the two insults applied alone. Possible mechanisms of action include opposite effects of the two insults on the blood-brain barrier, with radiation increasing permeability and methyl mercury decreasing it. GRA

N77-28729# Professional Staff Association of the Rancho Los Amigos Hospital, Inc., Downey, Calif.
EFFECTS OF ATMOSPHERIC POLLUTANTS ON HUMAN PHYSIOLOGIC FUNCTION Final Report, 1 Jun. 1971 - Jun. 1976
Jack D. Hackney Jan. 1977 116 p refs
(Grant EPA-R-801396)
(PB-265846/6; EPA-600/1-77-007) Avail: NTIS HC A06/MF A01 CSCL 06P

Short term health effects of common ambient air pollutants, particularly photochemical oxidants, were investigated under controlled conditions simulating typical ambient exposures. Volunteer subjects were exposed, in an environmental control chamber providing highly purified background air, to single pollutants or mixtures under conditions of realistic secondary stress (heat and intermittent exercise). Normal men exposed to ozone (03) showed respiratory symptoms, pulmonary function decrement, and alterations in red cell biochemistry. Subjects with asthma of clinical airway hyperactivity appeared to experience more severe effects of 03 than normals, and subjects chronically exposed to ambient 03 appeared to be less reactive than those living in non 03 polluted areas. GRA

N77-28730# Mayo Foundation, Rochester, Minn.
DEVELOPMENT OF HIGH-RESOLUTION ULTRASONIC IMAGING TECHNIQUES FOR DETECTION AND CLINICAL ASSESSMENT OF CARDIOVASCULAR DISEASE Report for 18 Apr. - 17 Oct. 1976
Titus C. Evans, Jr., Philip S. Green, and James F. Greenleaf 28 Apr. 1977 73 p Prepared in cooperation with Stanford Res. Inst., Menlo Park, Calif.
(Contract N01-HV-4-2904)
(PB-265728/6; NIH-N01-HV-4-2904-3J) Avail: NTIS HC A04/MF A01 CSCL 06B

Ultrasound instrumentation and methods for the detection and assessment of atherosclerosis in carotid and femoral arteries of living patients are tested. Using both laboratory and clinical versions of a high-resolution B-scan and Doppler imaging system, physicians have successfully scanned the carotid arteries on both sides of the neck in 250 patients. Eighteen of the patients imaged with the clinical instrument were also studied by angiography. These cases were studied in a double-bind analysis to check interpretation of the B-scans. Atherosclerotic lesions were readily identified and quantified. Results were comparable to, and sometimes better than, those obtained by using roentgen angiography. GRA

N77-28731# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
INFORMATION PROCESSING OF DOT MATRIX DISPLAYS Final Report, 1 Jun. 1974 - 1 Mar. 1976
Gregory L. Peters and Gregory J. Barbato Oct. 1976 32 p refs
(AF Proj. 2020)
(AD-A036668; AFFDL-TR-76-22) Avail: NTIS HC A03/MF A01 CSCL 05/8

The present studies were designed to assess the performance impact of symbologies composed of discrete elements relative to more conventional continuous symbologies. In an attempt to examine information processing of various components of behavior--such as information input, and central processing and output, three different tasks were selected. A two-or-four alternative choice reaction time task demonstrated an ability to measure a difference between punctate and continuous information, and suggested that the difference is reduced with increased task complexity. A memory search task demonstrated the importance of symbology compatibility, and a display search task revealed equal search efficiencies for punctate and continuous alphanumerics. Additional areas of investigation are discussed. GRA

N77-28732# Honeywell, Inc., Minneapolis, Minn.
COLOR CODING EFFECTS ON HUMAN PERFORMANCE: AN ANNOTATED BIBLIOGRAPHY Final Report
Ellen Barker and Marjorie J. Krebs 1 Apr. 1977 96 p refs
(Contract N00014-76-C-0355)
(AD-A039318; HONEYWELL-77SRC39; ONR-CR-213-136-1F)
Avail: NTIS HC A05/MF A01 CSCL 05/5

Abstracts and references for 78 studies and review articles are provided which are concerned with one or more aspects of color effects on human performance. Major emphasis was placed on including studies of the effect of color as a coding dimension in various tasks. However, articles on a variety of other topics related to the use of color have been included such as: the number of identifiable colors, selection of specific colors, peripheral vision for color, issues of legibility and acuity, etc. In addition, seven reviews of color literature are cited. GRA

N77-28733 Ohio State Univ., Columbus.
SYSTEM MODELING AND SIMULATION: APPLICATION OF A RESEARCH METHODOLOGY AND TEST Ph.D.
Robert George Mills 1976 168 p
Avail: Univ. Microfilms Order No. 77-2462

An approach to modeling and simulating human performance in systems is described. Results indicate that given a known data base, a highly accurate computer simulation could be developed; such that, correlations between its output and the known data base exceeded 0.94, and the verified complete simulation could not accurately simulate team performance when processing input data collected from independent operators. A discussion of the verification process and criteria, implications of test results with respect to methodology and computer simulation modeling and recommendations for future research is presented. Dissert Abstr.

N77-28734# Aeronautical Research Council, London (England).
THE DEVELOPMENT OF PORTABLE COOLERS FOR THE LIQUID CONDITIONED SUIT
G. F. Barlow (RAE, Farnborough, England) 1975 35 p refs Supersedes RAE-TR-74114 and ARC-35793
(ARC-CP-1330; RAE-TR-74114; ARC-35793;
ISBN-011-470940-8) Avail: NTIS HC A03/MF A01; HMSO £1.60; PHI

Two portable coolers for use with liquid conditioned suits have been designed and developed; one using solid carbon dioxide as the heat sink and the other water-ice. They provide 250 W h of cooling at rates up to 350 W with outlet temperatures of 12 C and 20 C respectively; their weights are 5.8 kg and 4.6 kg. The water-ice cooler can be recharged without replacing the water or battery by connecting it to a recharging unit which has been designed. This greatly reduces the handling problems normally associated with portable coolers. The results of laboratory and field trials in ambient temperatures up to 40 C are presented, with recommendations for further development. Author

N77-28735# Aeronautical Research Council, London (England).
SPECIMEN SIZE-ROLLS FOR AIRCREW HEADGEAR BASED ON AN ANALYSIS OF THE HEAD MEASUREMENTS OF 2000 ROYAL AIR FORCE AIRCREW
R. E. Simpson (RAE, Farnborough, England) 1975 110 p refs Supersedes RAE-TR-74072 and ARC-35666
(ARC-R/M-3774; RAE-TR-74072; ARC-35666;
ISBN-0-11-470919-X) Avail: NTIS HC A06/MF A01; HMSO £6.50; PHI

The head measurements have been processed to provide size-roll data in a form suitable for use by headgear designers. Specimen size-rolls are presented based on sizing control measurements thought likely to meet the requirements of the headgear designer. The logistic need for a minimum number of sizes of the end product has been the major criterion in the selection of control measurement range intervals; the acceptability of the intervals or sizing steps chosen will need to be proved for specific designs of headgear. Selection of the most appropriate sizing control measurement(s) by the designer will be influenced by many factors depending on the type of headgear, critical fit measurements, etc. Some guidance on control measurement selection is provided in the discussion of the results of the various approaches outlined. Author

N77-28736*# Life Systems, Inc., Cleveland, Ohio.
TECHNOLOGY ADVANCEMENT OF THE ELECTROCHEMICAL CO2 CONCENTRATING PROCESS Annual Report, Feb. 1975 - Mar. 1977
F. H. Schubert, R. R. Woods, T. M. Hallick, and D. B. Heppwer May 1977 75 p refs
(Contract NAS2-8666)
(NASA-CR-151995; LSI-ER-258-10) Avail: NTIS HC A04/MF A01 CSCL 06K

A five-cell, liquid-cooled advanced electrochemical depolarized carbon dioxide concentrator module was fabricated. The cells utilized the advanced, lightweight, plated anode current collector

concept and internal liquid-cooling. The five cell module was designed to meet the carbon dioxide removal requirements of one man and was assembled using plexiglass endplates. This one-man module was tested as part of an integrated oxygen generation and recovery subsystem. Author

N77-28737# Horizons Research, Inc., Cleveland, Ohio.
SCREENING STUDY TO IDENTIFY PHASE CHANGE COOLANTS FOR PORTABLE LIFE SUPPORT SYSTEMS Final Report, Jun. - Dec. 1976
Sandra S. Donovan Feb. 1977 72 p refs
(Contract N00140-76-C-6703)
(AD-A038504; P-385; NCTRF-TR-124) Avail: NTIS HC A04/MF A01 CSCL 06/11

A literature search to identify coolant candidates to be considered for replacing the ice-water system in a portable life support unit led to the following considerations: CO2, an NH3-CO2 mixture, and a salt such as potassium acid fluoride incorporated into ice. In the CO2 system, solid CO2 will sublimate and the resultant gases warm to 4 C, then be expelled from the suit. The heat absorption for this process is 153.0 Kcal/kg. To achieve 504 Kcal (2000 Btu) of cooling, 3.3 Kg (7.3 lbs) of CO2 is needed. This is an 83% improvement over the heat absorption of ice melting and warming to 4 C, or a 45% reduction in the weight of ice needed. The CO2 system appears to be completely safe. In the NH3-CO2 system, the CO2 will sublimate, the NH3 vaporize, and the resultant gases warm to 4 C, then with mixing be expelled from the suit. This system might be flammable, so should be examined in the laboratory. The heat absorption for this system is an impressive 198.5 Kcal/kg for an 0.8 mole ratio of NH3 to CO2. To achieve 504 Kcal (2000 Btu) of cooling, 2.5 Kg (5.6 lbs) of total coolant is needed. This is a 137% improvement over the heat absorption of ice melting and warming to 4 C, or a 58% reduction in the weight of ice needed. In the potassium acid fluoride-ice system, the heat of solution of the salt is added to the heat of fusion of ice. Over the temperature range of about -15 to 5 C, this system yield 121 Kcal/kg. To achieve 504 Kcal (2000 Btu) of cooling, 4.12 Kg (9.2 lbs) of total coolant is needed. This is a 45% improvement over the ice alone system. GRA

N77-28738# Purdue Univ., Lafayette, Ind. Purdue Lab. for Applied Industrial Control.
A UNIT TASK SIMULATOR FOR THE EVALUATION OF INTERACTIVE MAN-COMPUTER SYSTEMS M.S. Thesis
Edwin C. Alford and James R. Buck Dec. 1976 225 p refs
(Grant NSF APR-73-07822)
(PB-265097/6; NSF/RA-760457) Avail: NTIS HC A10/MF A01 CSCL 13H

The UTS (Unit Task Simulator) methodology was developed to assist the systems analyst in modelling the proposed interactive process or production control systems so that he could obtain data for use in evaluating and improving these systems. The UTS program allows simulation activities to be timed to occur in units of real time, and, therefore, the collected data accurately describes the behavior of the man and the process throughout the simulation. A survey of literature relevant to the analysis of man-computer systems is provided. GRA

N77-28739# Swedish Council for Building Research, Stockholm.
IMPACT LOADS PRODUCED BY HUMAN MOTION. PART 1: BACKROUND AND EXPERIMENTAL INVESTIGATION
Leif Nilsson 1976 211 p refs
(PB-264950/7; D13:1976; ISBN-91-540-2619-9) Avail: NTIS HC A10/MF A01 CSCL 13M

The research project falls into two main phases, a first one devoted to experimental investigation of some impact loads and their respective actions and a second one dealing with the definition of relevant performance requirements. The experimental part includes the measuring of dynamic effects which may be produced by human motion when striking various structural members. The results obtained are applicable to the values used when dimensioning e.g. slabs, stairs, walls, balcony parapets, rails, roofs etc. GRA

N77-28740# University of Southern Calif., Los Angeles. Inst. of Safety and Systems Management.
RESTRAINT SYSTEMS EVALUATION PROGRAM Final Report, Jun. 1974 - Jan. 1976
J. Baird, F. Sublett, R. Hughes, J. Didion, and J. Stoddard Feb. 1977 271 p refs
(Contract DOT-HS-010-1-176)
(PB-265562/9; USC-75; DOT-HS-802-286) Avail: NTIS HC A12/MF A01 CSCL 13F

Level 2 and Level 3 techniques of accident investigation were utilized. During the period of the study, 2,853 accidents were investigated using the Level 2 technique. An additional 29 collisions were studied under the Level 3, multidisciplinary technique. Four of the 29 collisions involved vehicles equipped with the Air Cushion Restraint System (ACRS). The four ACRS collisions occurred: 2 in California, 1 in Washington, and 1 in Wyoming. Three of the four ACRS cases involved ACRS deployment that functioned within design limits. The remaining 25 Level 3 cases and all Level 2 investigations were conducted in the cities of Los Angeles and Culver City, California. The Level 2 investigations revealed that 43% of the occupants of the vehicles studied utilized the restraint systems (lap and torso belts) available. Approximately 46% of the drivers and 36% of the right-front-passengers utilized the available restraints. GRA

N77-28741# School of Aerospace Medicine, Brooks AFB, Tex.
EVALUATION OF V-51 AND EAR (TRADEMARK) EARPLUGS FOR USE IN FLIGHT Final Report, 1 Jan. - 30 May 1976
Roger L. Stork and Donald C. Gasaway Feb. 1977 8 p
(AF Proj. 7930)
(AD-A038414; SAM-TR-77-1) Avail: NTIS HC A02/MF A01 CSCL 06/17

This study evaluated the test plugs for short-term comfort, ease of use, and their ability to allow pressure equalization in the external auditory canal during both ascent and descent. This study did not attempt to evaluate attenuation features of either earplug. Approximately half the test subjects thought the V-51 R earplugs were more comfortable than the EAR (trademark) plugs. All 30 test subjects indicated that the EAR (trademark) plugs were more difficult to use than the V-51 R plugs. All subjects completed the altitude flight series without ear pain or discomfort due to the changing barometric pressure. This study suggests that the majority of our aircrews could wear either earplug in flight without difficulty, thus providing increased protection against the hazardous noise environments in which the aircrews must perform. Author (GRA)

N77-28742# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Vision.
OPTICAL PROPERTIES AND VISUAL EFFECTS OF FACE MASKS
1977 11 p
(Contract N00014-75-C-0406)
(AD-A038197) Avail: NTIS HC A02/MF A01 CSCL 06/17

Working Group 48 was specifically asked to suggest procedures for studying the optical properties and visual effects of the XM-29 mask, and this report is based on material presented and discussed at Ft. Rucker on July 14-15, 1976. However, the techniques of field and laboratory testing described in the report may be generally used to study a variety of face masks. The XM-29 field protective mask is designed for military use to provide respiratory protection against field concentrations of all chemical and biological agents in vapor or aerosol form. GRA

N77-28743# Michigan Univ., Ann Arbor. Human Performance Center.
INTELLECTUAL PERFORMANCE UNDER STRESS Final Report, 1 Oct. 1971 30 Jun. 1976
Robert G. Pachella Sep. 1976 57 p refs
(Contract F44620-72-C-0019; ARPA Order 1949)
(AD-A038196; AFOSR-77-0313TR; Rept-010588-34-F) Avail: NTIS HC A04/MF A01 CSCL 05/10

This contract continued research programs funded from 1 June 1963 under contracts AF 49(638)-1235 and AF 49(638)-1736. One of the general objectives was to establish

a permanent research facility for the investigation of human performance capabilities and limitations that are of importance for the performance of men in a wide variety of man-machine systems. The effort within the present contract program has been directed more and more to the perceiving and remembering functions, with increasingly heavy emphasis on cognitive and intellectual factors and skills. GRA

N77-28744# Army Aeromedical Research Lab., Fort Rucker, Ala.

MASS SPECTROSCOPIC ANALYSIS OF POLYETHER AND POLYURETHANE FOAM PLASTICS DEGENERATION IN THE SPH-4 HELMET Final Report

Roderick J. McNeil and Frank S. Pettyjohn Oct. 1976 11 p (AD-A036447; USAARL-77-1) Avail: NTIS HC A02/MF A01 CSCL 06/17

Two components of plastic manufacture, n-butyl-phthalate and ethyl-methyl ketone, have been found in high concentrations contained in the low gaseous transfer coefficient polyethylene protective bag for the SPH-4 aviator helmet. These agents are the cause of the deterioration of the SPH-4 helmet polyether and polyurethane foam lining material. The use of mass spectrographic and gas chromatographic techniques provided the sampling of chemical compounds contained within the polyethylene bag. The solution to prevent foam liner deterioration is to remove the SPH-4 helmet from the protective bag. Author (GRA)

N77-28745# Desmatics, Inc., State College, Pa.

A STATISTICAL STUDY OF GRAB SAMPLING IN A CLOSED ENVIRONMENT

Dennis E. Smith and Terry L. King Feb. 1977 52 p (Contract N00014-75-C-1054) (AD-A036666; TR-106-4) Avail: NTIS HC A04/MF A01 CSCL 06/11

Maintaining the quality of an enclosed environment (e.g., aboard a submarine) requires monitoring of the environment by means of sampling procedures. One general type of sampling procedure is 'grab sampling', in which atmospheric samples are obtained, essentially instantaneously, in evacuated flasks. This report describes an experiment to determine (1) whether differences exist in the performance of four grab sampling methods, and (2) whether a delay in analyzing the samples affects the results (i.e., whether the samples have a shelf life). Eleven contaminants, each at a high and a low concentration level, were used in the study. Grab samples of these contaminants were analyzed at ten day intervals from the time sampling occurred until seventy days had elapsed. Although the experiment did not reveal differences in grab sampling methods, it did indicate that, for most of the contaminants, the samples do have a shelf life. Author (GRA)

N77-28746# Webb Associates, Yellow Springs, Ohio.

EFFECTS OF ENCUMBERING CLOTHING, PERSONAL-PROTECTIVE EQUIPMENT AND RESTRAINTS ON BODY SIZE AND ARM-REACH CAPABILITY OF USAF AIRCREW-MEN

Milton Alexander (AMRL), Lloyd L. Laubach, and John T. McConville May 1976 4 p refs Presented at the Aerospace Med. Assoc. Meeting, Bal. Harbour, Fla., 10-13 May 1976 (Contract F33615-76-C-5007; AF Proj. 7184) (AD-A036682; AMRL-TR-76-118) Avail: NTIS HC A02/MF A01 CSCL 06/14

Basic anthropometric dimensions provide engineers and designers with data on the range of body size variability that must be accommodated in the design and development of clothing, personal-protective equipment and workspaces. Designers of cockpits and similar workspaces must also be cognizant of the growth in body size associated with various configurations of clothing and personal-protective equipment and the effects of these assemblies on performance of the users. A study of a stratified sample of 32 USAF pilots wearing their operational assemblages of over-land and over-water flight gear and equipment was conducted. The study determined changes in critical workspace dimensions and arm and leg reach performance due to encumberments of the clothing and equipment. The results of the investigation indicated changes occurred both in body size and performance which were of significance to designers. Author (GRA)

N77-28747# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A PHASE PLANE APPROACH TO STUDY THE ADAPTIVE NATURE OF A HUMAN PERFORMING A TRACKING TASK

D. W. Repperger, W. C. Summers, E. J. Hartzell, and G. D. Callin Dec. 1976 5 p (AD-A036223; AMRL-TR-76-95) Avail: NTIS HC A02/MF A01 CSCL 05/8

One of the most complex and adaptive systems to study is a human involved in a closed loop tracking task. It is observed that when the forcing function of the closed loop system has a time varying velocity and acceleration profile, the human will track the input until it exceeds his physical (visual) limitation. When the input is changing too fast for the human to follow, adaptation (or regression) from tracking occurs. If, however, the input is not changing too rapidly, the human will reacquire the target and continue tracking. A study of this type of adaptability is considered here using the phase plane with a statistical analysis performed over a family of four input forcing functions. Author (GRA)

N77-28748# Calspan Corp., Buffalo, N. Y.

E-2 C SYSTEMS APPROACH TO TRAINING. PHASE 1 Final Report, Apr. 1975 - Jun. 1976

Robert C. Sugarman, Steven L. Johnson, John F. Mitchell, William M. Hinton, Jr., and Robert P. Fishburne, Jr. Dec. 1976 137 p (Contract N61339-75-C-01) (AD-A036264; NAVTRAEQUIPC-75-C-0101-1) Avail: NTIS HC A03/MF A01 CSCL 05/9

A revision of the instructional system for the E-2C was developed to enhance the cost-effectiveness of the training. The five-man E-2C crew consists of a pilot, copilot, combat information center officer (CICO), air control officer (ACO), and flight technician (FT), with training for these positions being conducted at RVAW-120, Norfolk Naval Air Station. This project followed the principles of Instructional Systems Design (ISD). After completing a task analysis for each position, the analysts prepared (in sequence) behavioral objectives, training support (media) requirements and lesson specifications. To support the effort, information was collected relevant to entry level behavior of trainees, existing resources available, and external influences (constraints) that affect the training system. The proposed syllabi incorporate a shift in emphasis toward: earlier 'hands-on' training, modified self-paced (individualized) instruction for most of the academic lessons; and a comprehensive plan for criterion-referenced performance assessment throughout the progression of cognitive (i.e., academic), practice, and sortie/scenario lessons. After the implementation and validation process is carried out in Phase 2, it is expected that significant reductions in training costs will be achieved through a shorter total course length, a greater proportion of synthetic training relative to in-flight practice, and a quality control program. Data provided will allow evaluation of the methodology, definition of the constraints and operating conditions that impact on aircrew training, and acquisition of cost, scheduling and manpower data for future ISD planning. Author (GRA)

N77-28749# Naval Medical Research Inst., Bethesda, Md.

HUMAN FACTORS AND DIVING EQUIPMENT DESIGN Progress Report

Arthur J. Bachrach 1977 11 p refs Proc. of 3d Joint Meeting of the Panel on Diving Physiol. and Technol., The United States-Japan Conf. on Develop. and Util. of Nat. Resources, (UJNR), Tokyo, 18-19 Jul. 1975 (AD-A040110) Avail: NTIS HC A02/MF A01 CSCL 05/5

For too long divers have been asked to compensate for inadequately designed equipment. In recent years, the Behavioral Sciences Dept at this institute--in cooperation with the Navy Experimental Diving Unit and the Performance Physiology Lab. of the University of California at Los Angeles--has engaged in a series of human engineering studies in diving. A combination of physiological measures, biomechanical dynamic anthropometric

measures, and underwater performance assessment appears to provide the most efficient way of approaching diver performance. The physiological cost of the equipment, the impact of the equipment on the diver's performance, and the diver's ability to work under varying environmental conditions still needs considerable research investigation. In this report the human bioengineering and performance physiology techniques outlined above are discussed; recommendations are made for further systematic cooperative research with other laboratories. GRA

N77-29729*# Kanner (Leo) Associates, Redwood City, Calif.
IDENTIFICATION OF 180 MILLION YEARS OLD, PROBABLY UNCHANGED MELANINE
K. Beyermann and D. Hasenmaier Washington NASA Jul. 1977 10 p refs Transl. into ENGLISH from Z. fuer Anal. Chem. (Wiesbaden), vol. 266, 1973 p 202-205
(Contract NASw-2790)
(NASA-TM-75132) Avail: NTIS HC A02/MF A01 CSCL 06C

The comparison of the infrared spectra of recent sepia melanine and of the content of the ink sac of fossilized cuttlefish indicates that the 180 million years old substance is unchanged melanine. Both substances behave identically on heating. Other procedures for identification of melamine are surveyed critically. Author

N77-29730# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
STUDY ON INCUBATORS AND HOLDING UNITS FOR CELLS AND TISSUES, PLANTS AND LOW VERTEBRATES. VOLUME 1: STUDY REPORT Final Report
U. Erich, K. Gruenewald, R. Henkel, U. Hoepstein, G. Lippner, D. Kersting, W. Martin, G. Neumann, F. Pittermann, F. Vogel et al May 1977 405 p Prepared jointly with STEEL 2 Vol.
(Contract ESA-2915/76-F-WMT(SC))
(ESA-CR(P)-943-Vol-1) Avail: NTIS HC A18/MF A01

A design is presented for a bioscience facility onboard Spacelab with four incubators and holding units for low vertebrates of the fish and amphibia class, cells and tissues, and plants. The incubators are intended to fit into the Spacelab single rack conforming to the Spacelab utilization program. A design concept is set up based on supporting systems analyses comprising the system configuration, subsystems, and complementary devices, as well as the experiment analysis, i.e., what the users can do with this incubator facility according to their scientific program. A model philosophy, plans for construction, tests and quality assurance, parts and materials lists, and operation procedures are dealt with and a full costing of the building phase is provided. A low cost approach is applied. Whenever possible, already existing hardware compatible with Spacelab constraints is taken into account. The updated equipment specifications are added. Author (ESA)

N77-29731# Dornier-System G.m.b.H., Friedrichshafen (West Germany).
STUDY ON INCUBATORS AND HOLDING UNITS FOR CELLS AND TISSUES, PLANTS AND LOW VERTEBRATES. VOLUME 2: DRAWINGS Final Report
U. Erich, K. Gruenewald, R. Henkel, U. Hoepstein, G. Lippner, D. Kersting, W. Martin, G. Neumann, F. Pittermann, F. Vogel et al May 1977 114 p 2 Vol.
(Contract ESA-2915/76-F-WMT(SC))
(ESA-CR(P)-943-Vol-2) Avail: NTIS HC A06/MF A01

Blueprints of four incubators and holding units for a bioscience facility onboard Spacelab are presented. The incubators are intended to contain low vertebrates of the fish and amphibia class, cells and tissues, and plants, and to fit into the Spacelab single rack conforming to the Spacelab utilization program. ESA

N77-29732# European Space Agency, Paris (France).
ELECTRON MICROSCOPE INVESTIGATIONS OF THE EFFECT OF FIVE-DAY WEIGHTLESSNESS SIMULATION ON THE DEVELOPMENT OF THE FROG EMBRYO (RANA TEMPORARIA) VESTIBULAR ORGAN
Juergen Neubert, Wolfgang Briegleb, Albrecht Schatz et al Jul. 1977 33 p refs Transl. into ENGLISH of 'Elektronenmikroskop. Untersuch. ueber den Einfluss fuenftaegiger Schwerelosigkeits-simulation auf die Entwicklung des Vestibularorgans von Frosch-embryonen der Gattung Rana temporaria', DFVLR, Bonn Report DLR-FB-76-66, 7 Dec. 1976 Original report in GERMAN previously announced as N77-25771 Original German report available from DFVLR, Cologne DM 17
(ESA-TT-397; DLR-FB-76-66) Avail: NTIS HC A03/MF A01

Results of experiments with fertilized frog eggs which developed under conditions of five days simulated weightlessness are described. The tests were designed to determine if there is any effect on the ability of the eggs to divide normally and on subsequent differentiation especially of the gravity receptor located in the vestibular organ. The submicroscopic structure of the macula utriculi (sensory epithelium) was compared between test and control animals. No abnormalities could be detected in the morphological structure. The results were compared with those of comparable experiments at zero g (Soyuz 10, Biosatellite 2, Gemini 8 and 12) and very good agreement was noted. Indications are given for future experimental steps to obtain greater clarity concerning the function of the gravity organ under conditions of simulated and real weightlessness. These experiments should be histo- and cytochemical ones. Author (ESA)

N77-29733 University of the Pacific, Stockton, Calif.
THE TRAINING OF HUMAN VOLUNTARY TORSION: TONIC AND DYNAMIC CYCLOVERSION Ph.D. Thesis
Richard Balliet 1976 115 p
Avail: Univ. Microfilms Order No. 77-7809

Using a visual biofeedback technique, subjects were trained to make accurate voluntary tonic cycloversions up to 26.5 degrees in magnitude. Tonic cycloversions were defined as cycloversions which could be sustained for a 5 second duration. Towards the end of training subjects were able to make voluntary cycloversions in the absence of any visual stimulus. In all tests where rotating visual stimuli were used voluntary cycloversions were not found to be significantly visually induced. All voluntary cycloversions were shown to be pure cycloversions around the visual axes. Dissert. Abstr.

N77-29734 Michigan Univ., Ann Arbor.
THE EFFECT OF THE ACOUSTIC REFLEX ON THE PERCEPTION OF SPEECH IN NOISE Ph.D. Thesis
Bruce Zachary Rappaport 1976 108 p
Avail: Univ. Microfilms Order No. 77-8015

The acoustic reflex serves to improve the intelligibility of speech in the presence of a competing noise background by altering the masking efficiency of the noise. For normal hearing with normally functioning acoustic reflexes, the intelligibility of consonants within monosyllabic utterances was measured in a background of wide-band noise. Speech-in-noise was presented in one ear, while a wide-band noise simultaneously presented in the opposite ear activated the acoustic reflex, the action of which is bilateral. Results suggest that the acoustic reflex may act to extend the linear range of auditory transmission to the cochlea. Dissert. Abstr.

N77-29735 Stanford Univ., Calif.
A CASE STUDY EVALUATION OF A SATELLITE VIDEO TELEMEDICINE PROJECT IN RURAL ALASKA Ph.D. Thesis
Dennis Read Foote 1976 225 p
Avail: Univ. Microfilms Order No. 77-7087

The findings of an empirical evaluation of a project using satellite television to support health care delivery in the Alaskan bush are reported. Two clinics in remote villages and a field hospital in another village were outfitted with television and satellite equipment that enabled them to transmit and receive a black-and-white video signal. The evaluation of the project used a variety of data collection techniques and sources to investigate the technical performance and the level of usage of the telemedicine system, the effects of the teleconsults on the processes and outcomes of the medical care, and the attitudes of the participants. Dissert. Abstr.

N77-29736 Michigan Univ., Ann Arbor.
CIRCULATORY AND LOCAL MUSCLE RESPONSE TO STATIC MUTUAL WORK Ph.D. Thesis

Thomas Jeffrey Armstrong 1976 225 p
Avail: Univ. Microfilms Order No. 77-7857

Examined are selected physiological and biomechanical aspects of manual work to determine if there is a relationship between: (1) circulatory performance and the intensity and duration of work; (2) circulatory and local muscle performance; (3) circulatory and local muscle performance and strength and sex of the subjects; (4) circulatory and local muscle performance and the position of the hand. Empirical models of the performance data showed that for a given relative work intensity, higher levels of mean arterial pressure, heart rate, double product, and forearm blood flow and lower levels of forearm resistance to blood flow were attained in the male subjects than in the female subjects. However, the average strength of the male subjects was much greater than the average strength of the female subjects. Therefore, a relationship between performance and sex cannot be distinguished from a relationship between performance and strength. Dissert. Abstr.

N77-29737 Purdue Univ., Lafayette, Ind.
COMPUTER-AIDED DIFFERENTIAL DIAGNOSIS OF HYPERTENSION Ph.D. Thesis
Wilfred Aaron Fordon 1976 191 p
Avail: Univ. Microfilms Order No. 77-7449

The development of a simple, effective hard three-nearest-neighbor algorithm to screen potential primary Aldosteronism patients is reported. Another result was a multistage algorithm using a modified form of the three-nearest-neighbor technique in tandem with modern conventional diagnostic procedures to determine potential Renovascular hypertensive patients. Preliminary investigation of an algorithm to optimize the techniques has resulted in confirming potential improvements over the hard techniques. Dissert. Abstr.

N77-29740# European Space Agency, Paris (France).
DEFINITION STUDY FOR SPACELAB EXPERIMENTS IN THE FIELD OF BASIC MEDICINE AND PROCESS ENGINEERING
Ull Erich, Wolfgang Hepp et al Jul. 1977 156 p refs Transl. into ENGLISH of 'Studie zur Definition von Spacelab-Experimenten aus dem Bereich der Med. Grundlagen u. Verfahrenstech.', Dornier System GmbH, Friedrichshafen Report BMFT-FB-W-76-15, Nov. 1976 Original report in GERMAN previously announced as N77-23747 Original GERMAN report available from ZLDI, Munich DM 38.45
(ESA-TT-391; BMFT-FB-W-76-15) Avail: NTIS HC A08/MF A01

Investigations on potential influences of Spacelab parameters on physiological and medical functions have revealed the possible use of Spacelab for medical tasks. A number of biomedical experiment proposals, defined during the course of the study in discussions with medical doctors, are presented. A first listing of instruments necessary to conduct the experiments in Spacelab is given and various activities to prepare Spacelab experiments are proposed. Author (ESA)

N77-29741# California Univ., San Francisco.
THE ROLE OF INORGANIC PHOSPHATE IN OXYGEN TRANSPORT Annual Progress Report, 1976 - 1977
George F. Sheldon Feb. 1977 17 p
(Contract DADA17-72-C-2030)
(AD-A038769) Avail: NTIS HC A02/MF A01 CSCL 07/2

The studies examine the mechanisms causing anemia associated with massive transfusion, injury, and protein depletion. Following injury protein depletion occurs, with loss of inorganic phosphate. As inorganic phosphate modulates red cell glycolysis, it is basic to oxygen transport. The study suggests that during anemia, oxygen unloading is increased as 2,3 DPG levels increase. By assessing erythropoieting in conjunction with red cell oxygen unloading capabilities, we have presumptive evidence that the hypoxic stimulus which results in erythropoietin elevation which causes red cell production, is compensated for by 2-3 DPG elevation. The persistent reticulopenic anemia which follows injury and results in the need for blood transfusion, may be due to DPG compensation for hypoxia failure of erythropoietin production and persistent anemia. Author (GRA)

N77-29742# Utah Univ., Salt Lake City. Dept. of Computer Science.
DIGITAL COLOR IMAGE PROCESSING AND PSYCHOPHYSICS WITHIN THE FRAMEWORK OF A HUMAN VISUAL MODEL
Olivier Dominique Faugeras Jun. 1976 134 p refs
(Contract DAHC15-73-C-0363; ARPA Order 2477)
(AD-A039007; UTEC-CSC-77-029) Avail: NTIS HC A03/MF A01 CSCL 06/16

A three-dimensional homomorphic model of human color vision based on neurophysiological and psychophysical evidence is presented. This model permits the quantitative definition of perceptually important parameters such as brightness, saturation, hue and strength. By modelling neural interaction in the human visual system as three linear filters operating on perceptual quantities, this model accounts for the automatic gain control properties of the eye and for brightness and color contrast effects. A psychophysical experiment was performed, using a high quality color television monitor driven by a general purpose digital computer. This experiment, based on the cancellation by human subjects of simultaneous color contrast illusions, allowed measurement of the low spatial frequency part of the frequency responses of the filters operating on the two chromatic channels of the human visual system. GRA

N77-29743# National Inst. for Occupational Safety and Health, Cincinnati, Ohio. Div. of Biomedical and Behavioral Science.
TECHNOLOGY FOR THE DEVELOPMENT OF A PORTABLE METABOLIC MONITOR
Ralph H. James Jun. 1976 50 p refs
(PB-266215/3; DHEW/PUB/NIOSH-76-171; NIOSH-76/171)
Avail: NTIS HC A03/MF A01 CSCL 06B

The need for an instrument to measure oxygen consumption to determine energy expenditure by indirect calorimetry at the job site under all work conditions is presented, with the characteristics of such an instrument. Evaluation of available devices in relation to stated requirements for breath-to-breath analysis and interval averaging is used to indicate the necessary components of the monitor. A portable metabolic monitor is described which is of recent European manufacture and design and which appears to meet all the major design requirements, with the exception of a flow meter. GRA

N77-29744# Occupational Safety and Health Administration, Washington, D. C.
INORGANIC ARSENIC Final Report
4 Feb. 1977 135 p refs
(PB-266182/5; OSHA-EIS-77-0204) Avail: NTIS HC A07/MF A01 CSCL 06J

Employee exposure to inorganic arsenic and its compounds is regulated by requiring that no employee be exposed to these substances above specific permissible exposure limits. A beneficial impact should be a reduction in the amount of excess morbidity and mortality experienced by persons occupationally exposed to inorganic arsenic. Major alternatives considered include regulation of ionorganic arsenic on the basis of its valence state or on the basis of specific chemical characteristics, regulation to various permissible exposure limits, use of biological monitoring versus environmental monitoring, and the use of personal protective equipment versus other means of exposure control. GRA

N77-29745# Occupational Safety and Health Administration, Washington, D. C.
SULFUR DIOXIDE
Apr. 1977 92 p refs
(PB-266160/1; OSHA-EIS-77-0415-D) Avail: NTIS HC A05/MF A01 CSCL 06J

Employee exposure to sulfur dioxide emissions are regulated by setting a permissible exposure limit of 2 parts sulfur dioxide per million parts air. Employee exposure measurements, methods of compliance, personal protective clothing and equipment, training, medical surveillance, employee observation of exposure measurements, and recordkeeping are discussed. This standard would apply to all workplaces in which employees are engaged in the production, release, storage, handling transportation, or use of sulfur dioxide. Beneficial impact on the workplace

environment will be a reduction in the health effects associated with hazardous exposure to sulfur dioxide. GRA

N77-29746# Illinois Univ., Chicago. School of Public Health.
HEALTH EFFECTS OF OCCUPATIONAL LEAD AND ARSENIC EXPOSURE
Bertram W. Carnow Feb. 1976 354 p refs Symp. held at Chicago, 24-25 Feb. 1975
(Contract PHS-210-75-0026)
(PB-266213/8; DHEW/PUB/NIOSH-76-134; NIOSH-76-134)
Avail: NTIS HC A16/MF A01 CSCL 06J

Papers were presented at a symposium to consider the impact of lead and arsenic on the workers' health, and to assist in establishing safe levels of these metals. Topics included: sources of lead and arsenic and monitoring of workplace both environmentally and biologically; toxicology of lead and arsenic; epidemiology of arsenic and lead exposure, long-term effects, and community exposure studies; carcinogenic effects of arsenic; and problems in setting threshold limit values for arsenic. GRA

N77-29747# European Space Agency, Paris (France).
ON THE PRACTICAL UTILITY OF CRITICAL FLICKER FUSION FREQUENCY MEASUREMENTS TO THE ASSESSMENT OF MENTAL WORKLOAD
Fred Volker Schick Jul. 1977 63 p refs Transl. into ENGLISH of 'Ueber die Verwendbarkeit einer praxisorientierten Messtech. der Flimmerverschmelzungsfrequenz zur Erfassung geistiger Belastung', DFVLR, Brunswick Report DLR-FB-76-67, 14 Dec. 1976 Original report in GERMAN previously announced as N77-25781 Original German report available from DFVLR, Cologne DM 19.10
(ESA-TT-398; DLR-FB-76-67) Avail: NTIS HC A04/MF A01

Two experiments were conducted to evaluate the utility of an advanced measuring device, coupled with a practicable measurement procedure, with respect to reliable and valid assessment of mental workload by measuring critical flicker fusion frequency (CFF). In the first experiment, basic variability of CFF scores, obtained from 11 subjects under nonworkload conditions, was studied. Error of measurement as well as physical and psychical interference variables were discussed to be sources of the large oscillations actually observed from data. It was found necessary to modify the measurement procedure. In the second experiment 10 subjects' CFF thresholds were examined. Statistical analysis revealed generally low reliability coefficients. Also thresholds failed to discriminate between low workload and high workload treatments. Results suggest that the magnitude of threshold's fluctuations due to individual physical and psychical interferences exceed threshold's alterations due to treatments.
Author (ESA)

N77-29748# Illinois Univ., Urbana-Champaign. Aviation Research Lab.
TASK COMPONENTS AND DEMANDS AS FACTORS IN DUAL-TASK PERFORMANCE
Robert Arthur North Jan. 1977 118 p refs
(Contract F44620-76-C-0009; AF Proj. 2313)
(AD-A038634; ARL-77-2/AFOSR-77-2) Avail: NTIS HC A06/MF A01 CSCL 05/5

This study explored the effects of interference between tasks as related to their specific functional requirements and under changing priorities. Four tasks were performed singly and in all pairwise combinations to compare their mutual interference levels. The tasks were one-dimensional compensatory tracking, and three self-paced Keyboard response tasks, one requiring a transformation by categorizing, one requiring storing and responding with the previous stimulus, and one requiring no intervening activity between stimulus recognition and response. Tracking paired with any of the the three Keyboard tasks was least interfering, Tracking and Tracking was moderately interfering, and Keyboard/Keyboard combinations the most interfering, suggesting that qualitatively dissimilar tasks are performed better than functionally similar tasks. The Keyboard task requiring continuous storing and response to the previous stimulus was highly disruptive when paired with other Keyboard tasks, and showed little evidence of interweaving with them, while the transformation Keyboard task was not as disruptive and could be interweaved with itself or the simple Keyboard task. GRA

N77-29749 Michigan Univ., Ann Arbor.
A METABOLIC RATE PREDICTION MODEL FOR MANUAL MATERIALS HANDLING JOBS Ph.D. Thesis
Arun Garg 1976 274 p
Avail: Univ. Microfilms Order No. 77-7920

A model was developed to estimate metabolic energy expenditure rates for a wide variety of manual materials handling jobs. The model is based on the assumption that a job can be divided into simple tasks (activity elements) and that the average metabolic energy expenditure rate of the job can be predicted by knowing the energy expenditures of the simple tasks and the time duration of the job. Dissert. Abstr.

N77-29750*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE 2ND CONFERENCE ON REMOTELY MANNED SYSTEMS (RMS): TECHNOLOGY AND APPLICATIONS
Jun. 1975 105 p Conf. held at Pasadena, Calif., 9-11 Jun. 1975 Sponsored in part by NASA, Southern Calif. Univ., Human Factors Soc., and US Council for the Theory of Machines and Mechanisms
(NASA-CR-148013) Avail: NTIS HC A06/MF A01 CSCL 05H

Control theory and the design of manipulators, teleoperators, and robots are considered. Applications of remotely manned vehicles to space maintenance and orbital assembly, industry and productivity, undersea operations, and rehabilitation systems are emphasized.

N77-29751*# Massachusetts Inst. of Tech., Cambridge.
CURRENT THEORIES OF MAN-MACHINE SYSTEMS
Thomas B. Sheridan *In* JPL The 2nd Conf. on Remotely Manned Systems RMS Jun. 1975 p 1-2 refs
Avail: NTIS HC A06/MF A01 CSCL 05H

Theories and models conventionally employed to analyze man machine systems such as remotely manned vehicles and processes are reviewed. Basic ideas of supervisory or heirarchical manning, and needs for modeling are discussed. Author

N77-29752*# University of Southern Calif., Los Angeles. Dept. of Industrial and Systems Engineering.
STOCHASTIC MODELLING OF REMOTELY MANNED SYSTEMS
Clinton J. Ancker, Jr. *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 3-4 refs
Avail: NTIS HC A06/MF A01 CSCL 05H

Digital simulation models of remotely manned vehicles are discussed and recommendations for statistical validation of all the models are considered. Author

N77-29753*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE HUMAN CONTROLLER IN CAR FOLLOWING
G. O. Burnham (Univ. of Southern Calif., Los Angeles) and G. A. Bekey *In its* The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 5-6 refs
Avail: NTIS HC A06/MF A01 CSCL 05H

The man machine interface between the human driver and his automobile during car following tasks was examined. A direct connection between models of the human operator and the theory of optimal control was established for car following situations involving both linear and nonlinear car dynamics. Results obtained from several types of mathematical models are discussed. Conventional parameter identification techniques were used to obtain the parameters of these models by comparing their performance to data obtained by aerial photogrammetry. The results indicate that there are two general classes of model structures: models assumed to have preview information and models without preview. Author

N77-29754*# Sandia Labs., Albuquerque, N. Mex.
AN INVESTIGATION OF SUPERVISORY CONTROL OF REMOTE MANIPULATION
Douglas E. McGovern *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 7-8 refs Sponsored in part by ERDA
Avail: NTIS HC A06/MF A01 CSCL 05H

Various types of augmented control for remote manipulation are discussed. A simple supervisory control program, is described and an estimate of system performance is given. Author

N77-29755*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EFFECT OF HAND-BASED SENSORS ON MANIPULATOR CONTROL PERFORMANCE
Antal K. Bejczy *In its* The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 9-10 refs
(Contract NAS7-100)
Avail: NTIS HC A06/MF A01 CSCL 05H

The effect of hand based sensors (e.g tactile, force, and proximity sensors) on the performance of manipulator control is discussed. A brief overview is presented on various experimental hand based information systems which provide the manipulator controller some nonvisual awareness of the task environment. It is established that differences in manipulator task categories and motion phases require different hand based information systems to cope with control performance requirements. Author

N77-29756*# Stanford Research Inst., Menlo Park, Calif.
LOCATION AND ACQUISITION OF OBJECTS IN UNPREDICTABLE LOCATIONS
A. J. Sword and W. T. Park *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 11-13 refs
(Contract DAAA15-74-C-0095)
Avail: NTIS HC A01/MF A01 CSCL 05H

A teleoperator system with a computer for manipulator control to combine the capabilities of both man and computer to accomplish a task is described. This system allows objects in unpredictable locations to be successfully located and acquired. By using a method of characterizing the work-space together with man's ability to plan a strategy and coarsely locate an object, the computer is provided with enough information to complete the tedious part of the task. In addition, the use of voice control is shown to be a useful component of the man/machine interface. Author

N77-29757*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TV REQUIREMENTS FOR MANIPULATION IN SPACE
Larry A. Freedman (RCA, Princeton, N.J.), William H. Crooks (Perceptronics, Inc., Woodland Hills, Calif.), and Paul P. Coan *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 15
Avail: NTIS HC A06/Mf A01 CSCL 05H

A video system for remote manipulation in space was studied. Analysis of basic manipulation tasks and visual requirements; simulation testing to determine the effects of task, scene parameter, and type of video system on manipulation performance; and video system selection and specification are described. Author

N77-29758*# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
GRAY-LEVEL TRANSFORMATIONS FOR INTERACTIVE IMAGE ENHANCEMENT.
R. C. Gonzalez and B. A. Fittes *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 17-19 refs

(Contract NAS8-29271)
Avail: NTIS HC A06/MF A01 CSCL 05H

A gray-level transformation method suitable for interactive image enhancement is presented. It is shown that the well-known histogram equalization technique is a special case of this method. Experimental results which establish the superiority of the procedure over histogram equalization are also described. Author

N77-29759*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
INTERACTIVE HANDLING OF TV AND RANGE DATA FOR REMOTELY CONTROLLED SYSTEMS
Yoram Yakimovsky *In its* The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 21

(Contract NAS7-100)
Avail: NTIS HC A06/MF A01 CSCL 05H

The sensory subsystem of the JPL robotics project is described. The first sensory instrument is a pair of TV cameras, which provides a stereo view of the area of interest. The second is a laser range finder, which can be aimed in a requested direction and measure distance to a surface point that reflects the beam back. Both instruments are controlled by and are interfaced to computer. The calibration process and basic applications to obtain measurements of the external environment are described. Author

N77-29760*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PROXIMITY SENSOR TECHNOLOGY FOR MANIPULATOR END EFFECTORS
Alan R. Johnston *In its* The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 23-24

(Contract NAS7-100)
Avail: NTIS HC A06/MF A01 CSCL 05H

Optical proximity sensing techniques which could be used to help control the critical grasping phase of a remote manipulation are described. The proximity sensors described use a triangulation geometry to detect a surface located in a pre-determined region. The design of the proximity sensors themselves is discussed, as well as their application to manipulator control with a local control loop, and possibilities for future development are discussed. Author

N77-29761*# Massachusetts Univ., Amherst.
DESIGN FOR A THREE-FINGERED HAND
F. R. Erskine Crossley and Franklyn G. Umholtz *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 25
Avail: NTIS HC A06/MF A01 CSCL 05H

A general purpose end-effector for use on the space manipulator proposed for the shuttle program was developed. The end-effector has the capabilities of a human hand and peel-off value as a human prosthetic device. The design evolved through two mock-up stages. The final form contains four electric motors. While thumb and forefinger bend, their ultimate phalanges maintain a parallel stance to one another. The grip centerline is at 45 degrees to the mounting base. Author

N77-29762*# Nebraska Univ., Lincoln.
THE LEMMA CONCEPT: A NEW MANIPULATOR
Leendert Kersten *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 27-28 refs

Avail: NTIS HC A06/MF A01 CSCL 05H

The differential drive assembly of Laboratory Engineering Model Manipulator Arm is briefly described. A theoretical investigation of the arm showed that the required accuracy of the manipulator is attainable. J.M.S.

N77-29763*# Essex Corp., Huntsville, Ala.
MANIPULATOR SYSTEM PERFORMANCE MEASUREMENT
M. Kirkpatrick, N. L. Shields, Jr., and T. B. Malone *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 29-30 refs
(Contract NAS8-30545)
Avail: NTIS HC A06/MF A01 CSCL 05H

Free-flying teleoperator technology for satellite servicing is reported. The rationale for a series of manipulator system tests is presented. Data are reported on movement time in a fine positioning task using two different manipulator systems. The movement time data showed reliable effects of movement direction and index of difficulty. These data were considered to be baseline performance measures for the manipulator system used and

modifications to the control and visual systems were suggested for future testing. Author

N77-29764*# V. I. Lenin Higher Institute of Electrical and Mechanical Engineering, Sofia (Bulgaria).
INERTIA FORCES IN ROBOTS AND MANIPULATORS
Michael S. Konstantinov *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 31-32 refs

Avail: NTIS HC A06/MF A01 CSCL 05H

A method is described for the simulation of the dynamic behavior (inertia forces) of a solid performing a tridimensional motion, wherein a discrete system of mass points rigidly attached to the solid is used. Three postulates are necessary and sufficient for dynamical equivalence: (1) the mass of the solid and the total of the concentrated masses should be equal, (2) the center of gravity of the solid and of the discrete system should coincide, and (3) the inertial ellipsoid of the solid and of the discrete system should be equal. Author

N77-29765*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REMOTE SERVICING OF FREE-FLYING SPACECRAFT
F. J. Cepollina and J. M. Mansfield (Rockwell Intern., Downey, Calif.) *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 33-34

Avail: NTIS HC A06/MF A01 CSCL 05H

A ground simulation to demonstrate system compatibility by enacting satellite ground installation, orbit delivery, space servicing, and contingency retrieval with the space shuttle orbiter was conducted. The basic configuration approach adopted for the spacecraft groups the standardized subsystems in the aft portion of the spacecraft and leaves the volume forward of the transition structure available for the mission peculiar equipment and sensors. The version used for this simulation is configured as an earth observatory with multispectral mapping and high resolution imaging sensors. All modules including the propulsion package and the sensor modules are replaceable on orbit in the event of depletion, wearout, malfunction, or the availability of an improved version. Author

N77-29766*# TRW Systems Group, Redondo Beach, Calif.
ON-ORBIT SERVICEABLE SATELLITE DESIGN
Abraham Fiul *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 35-36

Avail: NTIS HC A06/MF A01 CSCL 05H

Replacement of failed or worn-out equipment while the satellite remains on-orbit is considered. Factors discussed include: modular construction of the satellite components, design of the service unit, and control of the service unit. J.M.S.

N77-29767*# Martin Marietta Corp., Denver, Colo.
ORBITAL SERVICING, AND REMOTELY MANNED SYSTEMS
George W. Smith and Wilfred L. DeRocher, Jr. *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 37-38 refs
(Contract NAS8-30820)
Avail: NTIS HC A06/MF A01 CSCL 05H

The potential of concepts and techniques of remotely manned aerospace systems to fully exploit the utility and benefits of orbital servicing is discussed. Orbital servicing in the form of module exchange enhances the STS goals through replacement of failed equipment, resupply of consumables, and updating of obsolete equipment. Author

N77-29768*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE TUG SPACECRAFT/MODULE EXCHANGER (ON-ORBIT SERVICER)
Fritz C. Runge *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 39

(Contract NAS8-29743)
Avail: NTIS HC A06/MF A01 CSCL 05H

On-orbit exchange of spacecraft modules containing experiment or subsystem hardware or consumables performed at goesynchronous altitudes with the space tug and at lower altitudes with the shuttle is described. One promising concept for such a tug-mounted spacecraft module exchange is the McDonnell Douglas Direct-Access Servicer. This servicer can also be used in low orbit, mounted on the shuttle. In this concept, push-pull injector/retractor devices are combined with a rotating indexer to provide a minimum-complexity mechanism with a high capacity for coincident exchange of many modules. Author

N77-29769*# Comsat Labs., Clarksburg, Md.
A USER ASSESSMENT OF SERVICING AT GEOSTATIONARY ORBIT
Gary D. Gordon *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 41-42

(Contract NAS8-30849)
Avail: NTIS HC A06/MF A01 CSCL 05H

Orbital servicing assessed from the viewpoint of a commercial user of communications satellites at geostationary orbit. The need for servicing is emphasized by looking at the history of failures and defects occurring in communications satellites. The methods used in servicing were evaluated in terms of the needs of a communications satellite user. A system that utilizes servicing was studied, and some benefits in addition to cost savings were identified. Most of the assumptions and conclusions apply to earth observation satellites at geostationary orbit. Author

N77-29770*# Martin Marietta Corp., Denver, Colo.
THE ASSEMBLY OF LARGE STRUCTURES IN SPACE
George W. Smith and Shepard B. Brodie *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 43-44

Contracts NAS9-14319; NAS3-17835
Avail: NTIS HC A06/MF A01 CSCL 05H

Techniques developed for orbital assembly of the support structure for a 1000 meter diameter microwave power transmission system antenna are described. The operation is performed in two phases using the shuttle remote manipulator system in low earth orbit, and a mobile assembler in geosynchronous orbit. Author

N77-29771*# Pennsylvania State Univ., University Park.
CONTROL AND STABILITY PROBLEMS OF REMOTE ORBITAL CAPTURE
M. H. Kaplan and A. A. Nadkarni *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 45-46 refs

(Grants NGR-39-009-162; NsG-7078)
Avail: NTIS HC A06/MF A01 CSCL 05H

The dynamics and control aspects of orbital capture of space objects were studied. Differential angular rates and orientation between the object and the grappler were used to investigate the effects of misalignment as well as stability and control. The control responses after capture are discussed. The feasibility of nulling combined spin and nutation of a typical satellite is demonstrated by a Lagrangian formulation to establish a baseline situation. A free-flying teleoperator (FFTO) with a dynamically unbalanced grappler is shown to be desirable because extremely adverse cyclic torques may be generated. A combined teleoperator-satellite system assuming misalignments during capture was dynamically analyzed. Related responses and stability evaluations are included. Author

N77-29772*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REMOTELY PILOTED AIRCRAFT IN THE CIVIL ENVIRONMENT
Thomas J. Gregory, Walter P. Nelms, and Jay Karmarkar (Systems Control, Inc., Palo Alto, Calif.) *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 47-48

Avail: NTIS HC A06/MF A01 CSCL 05H

Existing remotely piloted vehicle application programs are described along with the technology of several important subsystems and the potential vehicle uses and operational concepts. Regulatory constraints and present and future study activities that may lead to demonstration and then operational programs are discussed. Author

N77-29773*# Office of the Oceanographer of the Navy, Alexandria, Va.
AN OVERVIEW OF UNDERWATER REMOTELY MANNED SYSTEMS AND SUB-SYSTEMS
Andreas Rechnitzer, B. *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 49

Avail: NTIS HC A06/MF A01 CSCL 05H
A current overview of how the underwater facet of remotely manned systems has progressed since 1972 is presented. The current approaches being pursued and the success of American and foreign technology is assessed. Author

N77-29774*# Naval Undersea Center, San Diego, Calif.
AN UNDERWATER WORK SYSTEMS PACKAGE
Norman B. Estabrook *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 51-52

Avail: NTIS HC A06/MF A01 CSCL 05H
A modular unit which is adaptable to several existing deep sea submersibles was developed to extend their working abilities and acquire knowledge of components and techniques for working in the deep sea environment. This work systems package is composed of an aluminum pipe structure on which are mounted two six-function grabber arms, a seven function manipulator, tool suit, 1,000/lb. capacity winch, electrohydraulic power supply, electronics housing, lights, and television. The unit is designed to be operated by itself either remotely or with divers, attached to manned submersibles, or mounted on unmanned cable-controlled submersibles. Author

N77-29775*# Woods Hole Oceanographic Institution, Mass.
FORCE FEEDBACK SYSTEMS IN UNDERSEA MANIPULATOR APPLICATIONS
Alan J. Pesch (Eclectech Assoc., Inc.), William R. Bertsche (Eclectech Assoc., Inc.), and Clifford Winget *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 57-58 refs
Avail: NTIS HC A06/MF A01 CSCL 05H
The manual control behavior of the operator with various levels of manipulator system complexity was studied in order to determine the relationships among control system dynamics, certain base engineering variables, controller designs and system performance. Based on the data obtained, a set of general transfer functions were prepared to provide a mathematical model of the various levels of potential force feedback fidelity as a function of force backlash present in alternate engineering designs. Author

N77-29776*# Perceptronics, Inc., Woodland Hills, Calif.
CONTROL AUTOMATION IN UNDERSEA MANIPULATION SYSTEMS
Amos Freedy and Gershon Weltman *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 59-60 refs

Avail: NTIS HC A06/MF A01 CSCL 05H
The requirements for the successful use of automated manipulation in an undersea environment are discussed, and initial specifications for systems which share control between a human operator and an autonomous control element are established. Areas of concern include: (1) objectives of automation; (2) characteristics of the underwater task; (3) hierarchy of control algorithms; (4) man/machine interface; (5) sensory feedback; and (6) general system organization. Special emphasis is placed on the solutions to the problem of controlling an undersea manipulator which is capable of performing certain automatic functions and implementing these solutions using current technology. Current capabilities for control automation are summarized. Author

N77-29777*# Stuttgart Univ. (West Germany).
INDUSTRIAL ROBOTS IN EUROPE - MARKET, APPLICATIONS AND DEVELOPMENTS
Rolf D. Schraft *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 63-64 refs

Avail: NTIS HC A06/MF A01 CSCL 05H
Different companies involving a wide range of products and manufacturing processes were studied to define the requirements for industrial robots. A survey of all such automatic units offered on the world market was made to establish a data base. Principal applications include coating, spot welding, and loading and unloading operations. Author

N77-29778*# Unimation, Inc., Danbury, Conn.
DESIGNING ROBOTS FOR INDUSTRIAL ENVIRONMENTS
In JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 65
Avail: NTIS HC A06/MF A01 CSCL 05H
Environmental hazards to industrial robots are summarized. The inherent reliability of the design of the Unimate robot is assessed and the data used in a management system to bring the reliability performance up to a level nearing what is theoretically available. The design is shown to be capable of a mean time between failure of 400 hours and an average up time of 98%. Specific design decisions made in view of application requirements are explored. Author

N77-29779*# Stanford Research Inst., Menlo Park, Calif.
TOPICS IN PROGRAMMABLE AUTOMATION
C. A. Rosen *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 67-68 refs

Avail: NTIS HC A06/MF A01 CSCL 05H
Topics explored in the development of integrated programmable automation systems include: numerically controlled and computer controlled machining; machine intelligence and the emulation of human-like capabilities; large scale semiconductor integration technology applications; and sensor technology for asynchronous local computation without burdening the executive minicomputer which controls the whole system. The role and development of training aids, and the potential application of these aids to augmented teleoperator systems are discussed.

N77-29780*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
INFORMATION AND CONTROL ISSUES OF ADAPTABLE-PROGRAMMABLE ASSEMBLY SYSTEMS FOR MANUFACTURING AND TELEOPERATOR APPLICATIONS
J. L. Nevins and D. E. Whitney *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 69-70

Avail: NTIS HC A06/MF A01 CSCL 05H
The real requirements of a task or task environment must be considered in developing a program for mechanical or electrical manipulators. Manipulation tasks must be analyzed, the information and control needed to accomplish them must be determined, and sensors, movers, controllers, and displays must be designed. Operations research in developing a computer controlled man-supervised multi-moded manipulator for an assembly system is described. Author

N77-29781*# Waseda Univ., Tokyo (Japan).
ARTIFICIAL SOFTNESS SENSING - AN AUTOMATIC APPARATUS FOR MEASURING VISCOELASTICITY
I. Kato, Y. Kudo, and K. Ichimaru *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 79-80 refs

Avail: NTIS HC A06/MF A01 CSCL 05H
Synthetic polymer models of several degrees of softness were subjected to standard creep tests to determine their viscoelastic characteristics. The automatic measuring apparatus and the theory of measurement used in modeling the human recognition of the softness factor are described. Author

N77-29782*# California Univ., Los Angeles. Biotechnology Lab.
SYSTEM INTEGRATION OF PATTERN RECOGNITION, ADAPTIVE AIDED, UPPER LIMB PROSTHESES
John Lyman, Amos Freedy, and Moshe Solomonow *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 81 refs
Avail: NTIS HC A06/MF A01 CSCL 05H

The requirements for successful integration of a computer aided control system for multi degree of freedom artificial arms are discussed. Specifications are established for a system which shares control between a human amputee and an automatic control subsystem. The approach integrates the following subsystems: (1) myoelectric pattern recognition, (2) adaptive computer aiding; (3) local reflex control; (4) prosthetic sensory feedback; and (5) externally energized arm with the functions of prehension, wrist rotation, elbow extension and flexion and humeral rotation. Author

N77-29783*# Utah Univ., Salt Lake City.
APPLICATION OF A POSTULATE BASED CONTROL THEORY FOR AN ARTIFICIAL ARM
S. C. Jacobsen and R. B. Jerard *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 83-84 refs

Avail: NTIS HC A06/MF A01 CSCL 05H

The biocontroller, remnant of the natural arm, and feedback elements must be considered in designing a controller for an above elbow artificial arm for amputees. This fundamental postulate is used to derive equations for developing the controller, which is shown in block diagrams.

N77-29784*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
VOICE CONTROLLED ADAPTIVE MANIPULATOR AND MOBILITY SYSTEMS FOR THE SEVERELY HANDICAPPED
E. Heer, G. A. Wiker, and A. Karchak, Jr. (Rancho Los Amigos Hospital, Downey, Calif.) *In its* 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 85-86

Avail: NTIS HC A06/MF A01 CSCL 05H

Efforts by NASA and the VA to apply available teleoperator/robot technology to rehabilitate amputees and spinal cord injured patients having severe loss of motor, manipulative, and sensory capabilities in the lower and/or upper extremities are summarized. Techniques developed include the control of a wheelchair by voice control or tongue chinswitch. The voice recognition computer and its operation are also described.

N77-29785*# Heidelberg Univ. (West Germany).
DESIGN AND CONTROL OF A MANIPULATOR FOR TETRAPLEGICS
V. Paeslack and H. Roesler *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 87-88

Avail: NTIS HC A06/MF A01 CSCL 04H

A concept for the design of a manipulator for tetraplegics must be based on the mutual adaptation of system determining properties of the disabled operator, the manipulator, and the environment. Because the reduced capability of tetraplegics allows control of only three degrees of freedom at a time (instead of the normal fifteen), the structure of the environment must be adjusted. A manipulator is described which includes a three dimensional control stick operated by the lips and mouth. Author

N77-29786*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LUNAR ROVER VEHICLE - AN IMPLICATION FOR REHABILITATION
Samuel R. McFarland (Southwest Research Inst., San Antonio, Tex.) and Gary R. Primeauk *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 91

Avail: NTIS HC A06/MF A01 CSCL 05H

The feasibility of adapting the lunar roving vehicle control concept to automobiles and vans for quadraplegics was investigated. Topics discussed include the current state of automobile handicapped controls, a description of the affected population, and a design for interfacing the control system into a passenger vehicle.

N77-29787*# Institute M. Pupin, Belgrade (Yugoslavia).
NEW CONTROL CONCEPT OF ANTHROPOMORPHIC MANIPULATORS
M. Vukobratovic, D. Stokic, and D. Hristic *In* JPL The 2nd Conf. on Remotely Manned Systems (RMS) Jun. 1975 p 93-94 refs
Avail: NTIS HC A06/MF A01 CSCL 05H

The control of active articulated mechanisms involves the construction of trajectories and corresponding forces (torques). Two procedures for developing mathematical models of manipulator dynamics are explored. The control task can be formulated as follows: define the dynamic control parameters of the basic manipulator configuration with three degrees of freedom, which should perform movements at N points of the working space. The task can be solved by forming programmed coordinated motion which have to realize the adopted tip trajectory. Author

N77-29788*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A PRELIMINARY INVESTIGATION OF THE ENVIRONMENTAL CONTROL AND LIFE SUPPORT SUBSYSTEM (EC/LSS) FOR THE SPACE CONSTRUCTION BASE MANUFACTURING MODULES
Hubert B. Wells Apr. 1977 56 p refs
(NASA-TM-78123) Avail: NTIS HC A04/MF A01 CSCL 06K

The preliminary data of the environmental control and life support subsystem for a space construction base manufacturing module was reported. A space processing module, which is capable of performing production biological experiments, was chosen as a baseline configuration. The primary assemblies and components considered for use were humidity and temperature control, ventilation fan, cabin fan, water separator, condensate storage, overboard dumping, distribution system, contaminant monitoring, cabin sensors, and fire and smoke detection. Author

N77-29789# Applied Psychological Services, Wayne, Pa.
DEVELOPMENT AND VALIDATION OF AN EQUATION FOR PREDICTING THE COMPREHENSIBILITY OF TEXTURAL MATERIAL Final Report, Mar. 1974 - Dec. 1976
Allan R. Williams, Arthur I. Siegel, James R. Burkett (AFHRL, Lowry AFB, Colo.), and Steven D. Groff (AFHRL, Lowry AFB, Colo.) Brooks AFB, Texas AFHRL Feb. 1977 56 p refs
(Contract F41609-75-C-0025; AF Proj. 2313)
(AD-A040755; AFHRL-TR-77-8) Avail: NTIS HC A04/MF A01 CSCL 05/10

Norms for Air Force technical training materials were developed for seven previously developed Structure-of-Intellect and seven psycholinguistically oriented variables which have been used to assess the readability/comprehensibility of textual materials. Separate norms are presented for Air Force study guides, manuals, career development course materials, and technical orders. An 'overall' norm is also presented along with norms on the same variables for a small sample of general literature. A multiple linear regression equation, which relates the various comprehensibility measures to measured comprehensibility, was developed and cross-validated. Author (GRA)

N77-29790# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
APPLICATION OF TRACKING TASKS IN ERGONOMIC STUDIES [ZUR ANWENDUNG VON REGELAUFGABEN BEI ERGONOMISCHEN UNTERSUCHUNGEN]
W. Stein and E. Pioch Oct. 1975 136 p refs In GERMAN; ENGLISH summary
(FB-23) Avail: NTIS HC A07/MF A01; Forschungsinst. fuer Anthropotech., Meckenheim, West Ger. DM 10

A classification of presently known tracking task measurement approaches is suggested which includes steady, unsteady, and secondary tracking tasks. Examples of unsteady tasks are critical and adaptive tracking tasks. A multi-purpose test bench for presenting tracking tasks is described. The critical tracking

tasks and their various possible applications are explained. The analysis of manual control behavior is facilitated by the use of human operator models. A review and a description of tracking tasks and their use by various investigators is given. Some observations on the reliability and validity of tracking tasks are also presented. Some applications of tracking tasks in various areas of psychology, medicine, and pharmacology are mentioned. Author (ESA)

N77-29791# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
LINEAR MODELS FOR MAN AS CONTROLLER [LINEARE MODELLE FUER DEN MENSCHEN ALS REGLER]
G. Johannsen, H. E. Boller, E. Donges, and W. Stein Nov. 1976 239 p refs In GERMAN
(FB-24) Avail: NTIS HC A11/MF A01

Two approaches are investigated for linear modeling of man as controller based on two essentially different control techniques: quasilinear approach and optimal theoretical approach. Basic concepts in the field of man-machine systems and manual control are explained and general aspects of the model description of man as controller indicated. The quasilinear approach is based on correlation methods and classical frequency range methods. The human frequency characteristic is viewed from a nonparametric and parametric angle. An extended quasilinear model accounting for the physiological properties of extremity motions is described. The optimal theoretical human controller model discussed is based on optimal control and estimation theory. ESA

N77-29792# RAND Corp., Santa Monica, Calif.
THE PEACETIME EVALUATION OF THE PILOT SKILL FACTOR IN AIR-TO-AIR COMBAT Interim Report
Peter DeLeon Jan. 1977 67 p
(Contract F44620-73-C-0011)
(AD-A039880; R-2070-PR) Avail: NTIS HC A04/MF A01 CSCL 05/9

An attempt was made to develop an objective measure for peacetime evaluation of a fighter pilot's air-to-air combat skills. Previous research and combat data from Korea and North Vietnam suggest that the skill of the individual pilot is crucial in the outcome of an aerial engagement. However, it has not been possible to estimate the actual effect or to identify what makes him superior. The Air Force cannot currently evaluate its pilots' air-to-air skills objectively during either their training or operational assignments. This report proposes four research areas that address the effectiveness and evaluation of these pilots: the selection of the prospective pilot from his undergraduate pilot training program, the air-to-air portions of his combat crew training squadron curriculum, the more efficient management of pilot resources, and an examination of the costs and benefits of dissimilar air combat training. It also proposes the development of a pilot skill index. GRA

N77-29793# School of Aerospace Medicine, Brooks AFB, Tex.
OXYGEN REGULATOR PERFORMANCE DURING DECOMPRESSION Interim Report, 1 Dec. 1975 - 31 Aug. 1976
Ronald D. Holden, Bruce F. Hiott, and Paul J. Zalesky Feb. 1977 16 p refs
(AD-A038415; SAM-TR-77-4) Avail: NTIS HC A02/MF A01 CSCL 06/11

Both static and dynamic performance characteristics of standard USAF oxygen regulators were evaluated during simulated decompression (loss of cabin pressurization), using the regulator test stand in conjunction with the decompression chamber at USAFSAM. A total of 10 regulators were tested, combining both torso- and panel-mounted types drawn from the standard USAF inventory. Outlet suction pressure, flow, positive pressure, and delivered oxygen dilution schedules were monitored and evaluated for two different decompression rates (4 and 8 seconds) while simulating the same total pressure change (10.9 psi to 4.4 psi) from 2,438 m to 9,144 m (8,000 to 30,000 ft). General findings indicate an extremely high initial pressure surge at the moment of decompression simultaneous with an immediate drop in the outlet P02 and a subsequent lag time before again maintaining a proper level of oxygen sufficiency at the flyer's mask. A minimum disruptive period of regulator performance was about 10-15 seconds but continued for a considerably longer time in many of the tests. Author (GRA)

N77-29794# Canyon Research Group, Inc., Westlake Village, Calif.
ANALYSIS OF HUMAN FACTORS ENGINEERING EXPERIMENTS: CHARACTERISTICS, RESULTS, AND APPLICATIONS Interim Report
Charles W. Simon Aug. 1976 119 p refs Prepared in cooperation with Hughes Aircraft Co., Culver City, Calif.
(Contracts F44620-76-C-0008; F44620-72-C-0086)
(AD-A038184; CWS-02-76; AFOSR-77-0333TR) Avail: NTIS HC A06/MF A01 CSCL 05/5

Two hundred thirty-nine experiments published in the Journal, Human Factors, during the period from 1958 to 1972 were analyzed for the purpose of discovering the characteristics of their experimental plans, the quality and character of their results, and the degree to which these results had been applied to real systems. The analysis revealed that these experiments investigated too small an experimental space, showed essentially no diversity in their selection of a basic experimental design, collected far more redundant data than was needed, and failed to properly handle the irrelevant variance arising from sequence effects. When a survey was made of those who conducted the experiments, it was discovered that slightly more than half of the experiments had been done to find answers of general applicability; less than a third were known or believed to have influenced the design of a real system. A majority of the investigators said they would not do their experiments any differently if they were to repeat them today. Some limited discussion on the implications of this analysis for an improved experimental methodology is included. GRA

N77-29795# Naval Undersea Center, San Diego, Calif. Ocean Technology Dept.
MANIPULATOR DEVELOPMENT AT THE NAVAL UNDERSEA CENTER Research and Development Report, 1965-1976
Richard W. Uhrich Jan. 1977 37 p refs
(AD-A038449; NUC-TP-553) Avail: NTIS HC A03/MF A01 CSCL 05/8

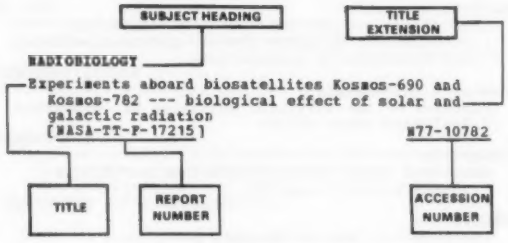
An overview of the remote manipulators developed by the Naval Undersea Center since 1965 is presented. Some of the factors affecting the design of manipulators for use at sea are defined, and specific recommendations are made for a manipulator system that would significantly improve the Navy's ability to perform underwater work. Author (GRA)

N77-29796# National Inst. for Occupational Safety and Health, Cincinnati, Ohio. Div. of Technical Services.
HEALTH AND SAFETY GUIDE FOR PLUMBING, HEATING, AND AIR CONDITIONING CONTRACTORS
May 1975 131 p
(PB-266409/2; DHEW/PUB/NIOSH-76/127; NIOSH-76-127) Avail: NTIS HC A07/MF A01 CSCL 06J

The guide is intended to assist in providing safe and healthy working conditions for the workers employed by plumbing, heating, and air conditioning contractors. Frequently violated regulations at construction sites include those which pertain to: walking and working surfaces, ladders, trenches, scaffolds, and railings; exits and exit markings; exposure to fibrous material, carbon monoxide, caustics, solvents, other toxic substances, heat, cold, radiation, and noise; personal protective equipment; machinery; portable power tools; and materials handling and storage. Recordkeeping requirements are outlined and checklists included for periodic inspections. GRA

SUBJECT INDEX

Typical Subject Index Listing



The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, a title extension is added, separated from the title by three hyphens. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

ABIOGENESIS
On the origin of biological chirality via natural beta-decay
A77-43005
The role of mineral surfaces in the origin of life
A77-43006
Symbiosis and the origin of life
A77-43008

ACCELERATION STRESSES (PHYSIOLOGY)
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067

ACCIDENTS
Accidental hypothermia - An experimental study of practical rewarming methods
A77-42138

ACTIVITY CYCLES (BIOLOGY)
A portable heart rate distribution recorder for studying daily physical activity
A77-40661

ADAPTIVE CONTROL
A phase plane approach to study the adaptive nature of a human performing a tracking task
[AD-A036223] N77-28747
System integration of pattern recognition, adaptive aided, upper limb prostheses
N77-29782

ADIPOSE TISSUES
Thyroid cold acclimation influences on norepinephrine metabolism in brown fat
A77-42180

ADSORPTION
The role of mineral surfaces in the origin of life
A77-43006

AERIAL RECONNAISSANCE
Remotely piloted aircraft in the civil environment
N77-29772

AEROSPACE MEDICINE
Psychopharmacology in aviation and astronautics
A77-41064
Organization and operation of civil aviation medicine in the Soviet Union
A77-42144
Definition study for Spacelab experiments in the field of basic medicine and process engineering
[ESA-TT-391] N77-29740

AFTERIMAGES
Long-lasting afterimages caused by neural adaptation
A77-42871

AGE FACTOR
Event-related brain potentials - Comparison between children and adults
A77-42444

AGING (BIOLOGY)
Echocardiographic assessment of a normal adult aging population
A77-42396

AIR BAG RESTRAINT DEVICES
Restraint systems evaluation program
[PB-265562/9] N77-28740

AIR POLLUTION
Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats
A77-42405
Effects of atmospheric pollutants on human physiologic function
[PB-265846/6] N77-28729

AIRCRAFT ACCIDENTS
Fire injuries and the pathology and neuropathology of single acute exposures to combustion products - Pathology and neuropathology of aircraft fire victims
A77-40942
Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires - The assessment of the human survival response during aircraft accidents
A77-40945
Necessary medical and paramedical measures for an airport catastrophe
A77-40949

AIRCRAFT CONSTRUCTION MATERIALS
Fire injuries and the pathology and neuropathology of single acute exposures to combustion products - Pathology and neuropathology of aircraft fire victims
A77-40942
Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires - The assessment of the human survival response during aircraft accidents
A77-40945

AIRCRAFT CONTROL
A survey of piloting factors in fixed-wing V/STOL aircraft
[AIAA 77-1147] A77-43177

AIRCRAFT NOISE
Effects of noise on sleep of babies --- prenatal aircraft noise effects
A77-41875
Arousal from sleep - The physiological and subjective effects of a 15 dB/A/ reduction in aircraft flyover noise
A77-42134

AIRCRAFT PILOTS
Psychological aspects of spatial orientation problems in pilots
A77-40658

AIRCRAFT SAFETY
Numerical prediction of head/neck response to shock-impact
A77-42567

AIRLINE OPERATIONS
Inefficiency of sanitation measures aboard commercial aircraft - Environmental pollution and disease
A77-42142

ALGAE
Alga growth potential of waste water effluents in Hawaiian receiving waters
[PB-265172/7] N77-28715

ALTITUDE SIMULATION
Sleep at altitude
A77-42136

Cardiac output during sleep at altitude
A77-42137

AMMONIA
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081
Screening study to identify phase change coolants for portable life support systems
[AD-A038504] N77-28737

ANEMIAS
Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations
A77-43724

ANGIOGRAPHY
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671

ANTHROPOLOGY
An anthropometric survey of 2,000 Royal Air Force aircrew, 1970/1971
[ARC-R/M-3772] N77-28722

ANTHROPOMETRY
An anthropometric survey of 2,000 Royal Air Force aircrew, 1970/1971
[ARC-R/M-3772] N77-28722
An anthropometric survey of 500 Royal Air Force aircrew heads, 1972
[ARC-R/M-3773] N77-28723
Specimen size-rolls for aircrew headgear based on an analysis of the head measurements of 2000 Royal Air Force aircrew
[ARC-R/M-3774] N77-28735
Effects of encumbering clothing, personal-protective equipment and restraints on body size and arm-reach capability of USAF aircrewmen
[AD-A036682] N77-28746
New control concept of anthropomorphic manipulators
N77-29787

ANTIADRENERGICS
Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade --- in Spontaneously Hypertensive Rats
A77-42185

ANTIBODIES
Antibodies to the entire synthetic gastrin molecule in the blood of healthy humans
A77-40884
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078

ANTIRADIATION DRUGS
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790

AORTA
Interaction of aortic pressure and left ventricular end-diastolic pressure in the dog
A77-42187

ARM (ANATOMY)
The LEMA concept: A new manipulator
N77-29762
Application of a postulate based control theory for an artificial arm
N77-29783

ARSENIC
Inorganic arsenic
[PB-266182/5] N77-29744
Health effects of occupational lead and arsenic exposure
[PB-266213/8] N77-29746

ARTERIES
Features of the cerebral and peripheral blood circulation in healthy people of different ages
A77-41154
Formation of additional nerve connections of the common carotid artery
A77-41224
Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries
A77-42395

ARTERIOSCLEROSIS
Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations
A77-43724

ARTIFICIAL INTELLIGENCE
Design for a three-fingered hand
N77-29761
Artificial softness sensing - an automatic apparatus for measuring viscoelasticity
N77-29781

ASSEMBLING
Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications
A77-43643

ASTRONAUT PERFORMANCE
Function of the otolithic apparatus of cosmonauts following space flight
A77-41082

ASTRONAUTS
Prolonged weightlessness effect on postflight plasma thyroid hormones
A77-42132

ATHLETES
Assessment of maximal aerobic power in specifically trained athletes
A77-41814
Thermoregulatory responses during competitive marathon running
A77-41819

ATTENTION
Dividing attention between auditory and visual perception
A77-40693

AUDITORY PERCEPTION
Exercise effects on the time of reactions to auditory stimuli
A77-40663
Dividing attention between auditory and visual perception
A77-40693
Effects of noise on sleep of babies --- prenatal aircraft noise effects
A77-41875

AUDITORY STIMULI
Determination of pulse rate variations caused by a stimulus --- heart response to acoustic stimuli
A77-40660
Exercise effects on the time of reactions to auditory stimuli
A77-40663

AUDITORY TASKS
Dividing attention between auditory and visual perception
A77-40693

AUTOMATA THEORY
Control automation in undersea manipulation systems
N77-29776
Topics in programmable automation --- for materials handling, inspection, and assembly
N77-29779
Information and control issues of adaptable-programmable assembly systems for manufacturing and teleoperator applications
N77-29780

AUTOMATIC CONTROL
Location and acquisition of objects in unpredictable locations --- a teleoperator system with a computer for manipulator control
N77-29756
Control automation in undersea manipulation systems
N77-29776
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784
Design and control of a manipulator for tetraplegics
N77-29785

AUTOMOBILE ACCIDENTS
Restraint systems evaluation program
[PB-265562/9] N77-28740

AUTOMOBILES
The human controller in car following
N77-29753
Lunar rover vehicle - an implication for rehabilitation
N77-29786

AUTORADIOGRAPHY
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184

B

BACKGROUND NOISE
The effect of the acoustic reflex on the perception of speech in noise
N77-29734
BED REST
Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol
A77-42139
BINOCULAR VISION
Hysteresis binocular grating perception - Contrast effects
A77-42870
BIOASSAY
Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires The assessment of the human survival response during aircraft accidents
A77-40945
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report --- for Spacelab biological experiments
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731
BIOASTRONAUTICS
Gravitation and the living organism --- Russian book
A77-41652
BIOCHEMISTRY
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070
Mucopolysaccharides and collagen in tissues of hypokinetic rats
A77-41071
BIOCONTROL SYSTEMS
Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects
A77-41151
Neural control of glycogen content and its diurnal rhythm in mouse pineal cell
A77-42181
Application of a postulate based control theory for an artificial arm
N77-29783
BIODYNAMICS
Numerical prediction of head/neck response to shock-impact
A77-42567
Modeling of the thermophysical processes accompanying muscle contraction in humans
A77-44001
BIOELECTRIC POTENTIAL
Study of color vision by the method of recording induced potentials
A77-41152
Event-related brain potentials - Comparison between children and adults
A77-42444
BIOINSTRUMENTATION
A portable heart rate distribution recorder for studying daily physical activity
A77-40661
Corneal seal device
[NASA-CASE-LEW-12258-1] N77-28716
Snap-in compressible biomedical electrode
[NASA-CASE-MSC-14623-1] N77-28717
Technology for the development of a portable metabolic monitor
[PB-266215/3] N77-29743
BIOLOGICAL EFFECTS
Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats
A77-42405
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report --- for Spacelab biological experiments
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731
BIOLOGICAL EVOLUTION
Motion sickness - An evolutionary hypothesis
A77-41640
Gravitation and the living organism --- Russian book
A77-41652
BIOMEDICAL DATA
Computer-based system for analysis of respiratory responses to exercise
A77-41821
BIONICS
Engineering models of the human thermoregulatory system - A review
A77-41950
BLOOD
Antibodies to the entire synthetic gastrin molecule in the blood of healthy humans
A77-40884
BLOOD CIRCULATION
Characterization of regional circulation and vasomotor regulation after a two-month space flight
A77-41066
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067
Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus
A77-41225
The role of inorganic phosphate in oxygen transport
[AD-A038769] N77-29741
BLOOD COAGULATION
The blood coagulation system during a 12-day immersion in water and the prophylactic role of rotation in a centrifuge
A77-41079
BLOOD FLOW
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184
BLOOD PLASMA
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man
A77-41816
Prolonged weightlessness effect on postflight plasma thyroid hormones
A77-42132
Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol
A77-42139
BLOOD PRESSURE
Ejection pressure and the diastolic left ventricular pressure-volume relation
A77-42182
Interaction of aortic pressure and left ventricular end-diastolic pressure in the dog
A77-42187
BLOOD VOLUME
Characterization of regional circulation and vasomotor regulation after a two-month space flight
A77-41066
Effects of growth, diving history, and high altitude on blood oxygen capacity in harbor seals
A77-41815
Ejection pressure and the diastolic left ventricular pressure-volume relation
A77-42182
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients
A77-42413
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension
A77-42993
BLUEPRINTS
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731

BODY COMPOSITION (BIOLOGY)
Effects of growth, diving history, and high altitude on blood oxygen capacity in harbor seals A77-41815
BODY FLUIDS
Total body water and lean body mass estimated by ethanol dilution A77-41813
BODY KINEMATICS
Parametric optimization in the problem of biped locomotion A77-43279
BODY MEASUREMENT (BIOLOGY)
An anthropometric survey of 2,000 Royal Air Force aircrew, 1970/1971 [ARC-R/M-3772] N77-28722
BODY TEMPERATURE
Convective and radiative heat transfer coefficients for the human body A77-41748
Thermoregulatory responses during competitive marathon running A77-41819
Thermal data from helicopters operating in a sub-arctic environment A77-42140
BODY WEIGHT
Total body water and lean body mass estimated by ethanol dilution A77-41813
BONE DEMINERALIZATION
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight A77-41065
BONE MARROW
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses A77-41076
BRAIN
The effect of decimeter waves on central cerebral structures A77-40882
Event-related brain potentials - Comparison between children and adults A77-42444
BRAIN CIRCULATION
Features of the cerebral and peripheral blood circulation in healthy people of different ages A77-41154
BREATHING APPARATUS
Optical properties and visual effects of face masks [AD-A038197] N77-28742
Oxygen regulator performance during decompression [AD-A038415] N77-29793
BURNS (INJURIES)
Effect of evaporative surface cooling on thermographic assessment of burn depth A77-42239

C

CALCIUM METABOLISM
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight A77-41065
CAPILLARIES (ANATOMY)
Capillary supply of skeletal muscle fibers in untrained and endurance-trained men A77-42188
CARBOHYDRATE METABOLISM
Carbohydrate and fat metabolism of unacclimatized men during and after submaximal exercise in cool and hot environments A77-40662
CARBON DIOXIDE
Technology advancement of the electrochemical CO2 concentrating process [NASA-CR-151995] N77-28736
Screening study to identify phase change coolants for portable life support systems [AD-A038504] N77-28737
CARBON DIOXIDE CONCENTRATION
Dynamic control of space cabin environmental parameters A77-41073
Defensive reactions of the organism when breathing elevated CO2 concentrations A77-41080
CARBON MONOXIDE
Effects of atmospheric pollutants on human physiologic function [PB-265846/6] N77-28729
CARBON MONOXIDE POISONING
Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires - The assessment of the human survival response during aircraft accidents A77-40945
CARDIAC VENTRICLES
Ejection pressure and the diastolic left ventricular pressure-volume relation A77-42182
Interaction of aortic pressure and left ventricular end-diastolic pressure in the dog A77-42187
Echocardiographic assessment of a normal adult aging population A77-42396
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography A77-42397
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension A77-42993
Pitfalls and limitations of M-mode echocardiography A77-44175
CARDIOGRAPHY
Cardiac output during sleep at altitude A77-42137
CARDIOLOGY
Review of epidemiology in clinical cardiology A77-42143
Exercise testing in the diagnosis of coronary heart disease - A perspective A77-43723
CARDIOVASCULAR SYSTEM
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man A77-41072
Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus A77-41225
Fastigial nucleus and orthostatic reflex in cat and monkey A77-42186
Development of high-resolution ultrasonic imaging techniques for detection and clinical assessment of cardiovascular disease [PB-265728/6] N77-28730
CAROTID SINUS REFLEX
Fastigial nucleus and orthostatic reflex in cat and monkey A77-42186
CATECHOLAMINE
The effect of some catecholamines on pulmonary circulation A77-40883
CENTRAL NERVOUS SYSTEM STIMULANTS
Psychopharmacology in aviation and astronautics A77-41064
CENTRIFUGING STRESS
The blood coagulation system during a 12-day immersion in water and the prophylactic role of rotation in a centrifuge A77-41079
CHEMICAL REACTIONS
Possible surface reactions on Mars - Implications for Viking biology results A77-41639
Symbiosis and the origin of life A77-43008
CIRCADIAN RHYTHMS
Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects A77-41151
Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol A77-42139

Neural control of glycogen content and its diurnal rhythm in mouse pineal cell
A77-42181

CIVIL AVIATION
Organization and operation of civil aviation medicine in the Soviet Union
A77-42144
Remotely piloted aircraft in the civil environment
N77-29772

CLINICAL MEDICINE
Review of epidemiology in clinical cardiology
A77-42143
New trends in phonocardiograph modulators
A77-43325
Evaluation and interpretation of the EKG /2nd revised edition/ --- German book
A77-43876
A case study evaluation of a satellite video telemedicine project in rural Alaska
N77-29735
Computer-aided differential diagnosis of hypertension
N77-29737

CLOSED ECOLOGICAL SYSTEMS
Microflora associated with beets during their growth in prolonged hydroponic cultivation
A77-41077
A statistical study of grab sampling in a closed environment
[AD-A036666] N77-28745

COGNITIVE PSYCHOLOGY
Intellectual performance under stress
[AD-A038196] N77-28743
Development and validation of an equation for predicting the comprehensibility of textural material
[AD-A040755] N77-29789

COLD ACCLIMATIZATION
Carbohydrate and fat metabolism of unacclimatized men during and after submaximal exercise in cool and hot environments
A77-40662
Thyroid cold acclimation influences on norepinephrine metabolism in brown fat
A77-42180

COLD WEATHER TESTS
Thermal data from helicopters operating in a sub-arctic environment
A77-42140

COLLAGENS
Mucopolysaccharides and collagen in tissues of hypokinetic rats
A77-41071

COLOR VISION
Study of color vision by the method of recording induced potentials
A77-41152
Increment spectral sensitivities of the primate late receptor potential and b-wave --- in retinal color processing
A77-42866
Visual capacities of the owl monkey /Aotus trivirgatus/. I - Spectral sensitivity and color vision. II - Spatial contrast sensitivity
A77-42867
Color coding effects on human performance: An annotated bibliography
[AD-A039318] N77-28732
Digital color image processing and psychophysics within the framework of a human visual model
[AD-A039007] N77-29742

COMBAT
The peacetime evaluation of the pilot skill factor in air-to-air combat
[AD-A039880] N77-29792

COMBUSTION PRODUCTS
Fire injuries and the pathology and neuropathology of single acute exposures to combustion products - Pathology and neuropathology of aircraft fire victims
A77-40942
Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires - The assessment of the human survival response during aircraft accidents
A77-40945

COMMUNICATION SATELLITES
A user assessment of servicing at geostationary orbit
N77-29769

COMPLEMENT (BIOLOGY)
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078

COMPUTER PROGRAMMING
Topics in programmable automation --- for materials handling, inspection, and assembly
N77-29779
Information and control issues of adaptable-programmable assembly systems for manufacturing and teleoperator applications
N77-29780

COMPUTER PROGRAMS
Numerical prediction of head/neck response to shock-impact
A77-42567
An investigation of supervisory control of remote manipulation
A77-43642

COMPUTER TECHNIQUES
Computer-based system for analysis of respiratory responses to exercise
A77-41821
Review of epidemiology in clinical cardiology
A77-42143
Computer-aided differential diagnosis of hypertension
N77-29737
Location and acquisition of objects in unpredictable locations --- a teleoperator system with a computer for manipulator control
N77-29756

COMPUTERIZED SIMULATION
System modeling and simulation: Application of a research methodology and test
N77-28733
A unit task simulator for the evaluation of interactive man-computer systems
[PB-265097/6] N77-28738

CONDUCTIVE HEAT TRANSFER
Modeling of the thermophysical processes accompanying muscle contraction in humans
A77-44001

CONFERENCES
Robots and manipulator systems; Proceedings of the Second Conference on Remotely Manned Systems, Los Angeles, Calif., June 9-11, 1975
A77-43641
Health effects of occupational lead and arsenic exposure
[PB-266213/8] N77-29746
The 2nd conference on Remotely Manned Systems (RMS): Technology and applications
[NASA-CR-148013] N77-29750

CONGENITAL ANOMALIES
Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries
A77-42395

CONSTRUCTION INDUSTRY
Health and safety guide for plumbing, heating, and air conditioning contractors
[PB-266409/2] N77-29796

CONTAINERS
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report --- for Spacelab biological experiments
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731

CONTROL STICKS
Design and control of a manipulator for tetraplegics
N77-29785

CONTROL THEORY
Current theories of man-machine systems
N77-29751
An investigation of supervisory control of remote manipulation
N77-29754

CONTROLLERS
Application of a postulate based control theory for an artificial arm
N77-29783
CONVECTIVE HEAT TRANSFER
Convective and radiative heat transfer coefficients for the human body
A77-41748
CONVULSIONS
The effect of experimentally-induced generalized convulsions on the cycle of wakefulness and sleep
A77-40881
COOLANTS
Screening study to identify phase change coolants for portable life support systems [AD-A038504]
N77-28737
COOLERS
The development of portable coolers for the liquid conditioned suit [ARC-CP-1330]
N77-28734
CORONARY ARTERY DISEASE
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671
Echocardiographic diagnosis of left anterior descending coronary artery disease
A77-40672
Exercise testing in the diagnosis of coronary heart disease - A perspective
A77-43723
CORONARY CIRCULATION
The role of potassium in the control of the coronary circulation: Mechanism of action and time course
N77-28719
CORROSION TESTS
Toxicological and skin corrosion testing of selected hazardous materials [PB-264975/4]
N77-28725
CRITICAL FLICKER FUSION
On the practical utility of critical flicker fusion frequency measurements to the assessment of mental workload [ESA-TT-398]
N77-29747
CRYSTAL STRUCTURE
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065
CRYSTALLINITY
A model for a non-chemical form of life - Crystalline physiology
A77-43007

D

DATA ACQUISITION
An anthropometric survey of 500 Royal Air Force aircrew heads, 1972 [ARC-R/M-3773]
N77-28723
DECIMETER WAVES
The effect of decimeter waves on central cerebral structures
A77-40882
DEGREES OF FREEDOM
The LEMMA concept - A new manipulator --- laboratory mechanical arm
A77-43646
DEPOLYMERIZATION
Mass spectroscopic analysis of polyether and polyurethane foam plastics degeneration in the SPH-4 helmet [AD-A036447]
N77-28744
DESIGN ANALYSIS
Snap-in compressible biomedical electrode [NASA-CASE-MSC-14623-1]
N77-28717
The LEMMA concept: A new manipulator
N77-29762
Designing robots for industrial environments --- economic factors and vulnerability
N77-29778
Design and control of a manipulator for tetraplegics
N77-29785
DIAGNOSIS
Effect of evaporative surface cooling on thermographic assessment of burn depth
A77-42239
Left precordial isopotential mapping during supine exercise
A77-42394
Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries
A77-42395
Exercise testing in the diagnosis of coronary heart disease - A perspective
A77-43723
Diagnosis of myocardial infarction - Historical notes from the Soviet Union and the United States
A77-43725
Evaluation and interpretation of the EKG /2nd revised edition/ --- German book
A77-43876
Computer-aided differential diagnosis of hypertension
N77-29737
DIASTOLE
Ejection pressure and the diastolic left ventricular pressure-volume relation
A77-42182
DIASTOLIC PRESSURE
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension
A77-42993
DIGESTIVE SYSTEM
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070
DIGITAL COMPUTERS
New control concept of anthropomorphic manipulators
N77-29787
DIGITAL SYSTEMS
Proximity sensor technology for manipulator end effectors --- hand mounted IR device to detect nearby objects
A77-43648
DIGITAL TECHNIQUES
Gray-level transformations for interactive image enhancement.
N77-29758
DISPLAY DEVICES
A psychophysical analysis of complex integrated displays [AD-A039260]
N77-28727
DIURNAL VARIATIONS
Neural control of glycogen content and its diurnal rhythm in mouse pineal cell
A77-42181
DIVING (UNDERWATER)
Effects of growth, diving history, and high altitude on blood oxygen capacity in harbor seals
A77-41815
Human factors and diving equipment design [AD-A040110]
N77-28749
DROSOPHILA
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795
DYNAMIC CONTROL
Dynamic control of space cabin environmental parameters
A77-41073
Application of a postulate based control theory for an artificial arm
N77-29783
New control concept of anthropomorphic manipulators
N77-29787
DYNAMIC LOADS
Impact loads produced by human motion. Part 1: background and experimental investigation [PB-264950/7]
N77-28739
DYNAMIC PROGRAMMING
Artificial softness sensing - an automatic apparatus for measuring viscoelasticity
N77-29781
DYNAMIC RESPONSE
The dynamic function of selected muscles of the forearm: An electromyographical and cinematographical analysis
N77-28718

E

E-2 AIRCRAFT
E-2 C systems approach to training. Phase 1
[AD-A036264] N77-28748

EAR
Formation of additional nerve connections of the common carotid artery
A77-41224

EAR PRESSURE TEST
Evaluation of V-51 and EAR (trademark) earplugs for use in flight
[AD-A038414] N77-28741

EAR PROTECTORS
Evaluation of V-51 and EAR (trademark) earplugs for use in flight
[AD-A038414] N77-28741

ECHOCARDIOGRAPHY
Echocardiographic diagnosis of left anterior descending coronary artery disease
A77-40672
Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries
A77-42395
Echocardiographic assessment of a normal adult aging population
A77-42396
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397
Pitfalls and limitations of M-mode echocardiography
A77-44175

ECONOMIC FACTORS
Designing robots for industrial environments --- economic factors and vulnerability
N77-29778

ELECTROCARDIOGRAPHY
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671
Left precordial isopotential mapping during supine exercise
A77-42394
Evaluation and interpretation of the EKG /2nd revised edition/ --- German book
A77-43876

ELECTROCHEMICAL CELLS
Technology advancement of the electrochemical CO2 concentrating process
[NASA-CR-151995] N77-28736

ELECTRODES
Snap-in compressible biomedical electrode
[NASA-CASE-MSC-14623-1] N77-28717

ELECTROENCEPHALOGRAPHY
EEG correlates of the quality of work of an operator during different functional states
A77-41153
Effects of noise on sleep of babies --- prenatal aircraft noise effects
A77-41875
Cardiac output during sleep at altitude
A77-42137
Event-related brain potentials - Comparison between children and adults
A77-42444

ELECTROLYTE METABOLISM
Mucopolysaccharides and collagen in tissues of hypokinetic rats
A77-41071
The electrolyte content in the blood of animals and transport of potassium-ion erythrocytes under a constant magnetic field
A77-41075

ELECTROMYOGRAPHY
The dynamic function of selected muscles of the forearm: An electromyographical and cinematographical analysis
N77-28718

ELECTRON MICROSCOPY
Electron microscope investigations of the effect of five-day weightlessness simulation on the development of the frog embryo (rana temporaria) vestibular organ
[ESA-TT-397] N77-29732

ELECTRONYSTAGMOGRAPHY
Method of photoelectric nystagmography
A77-40738

ELECTROPHYSIOLOGY
Sleep at altitude
A77-42136

ELECTROPLETHYSMOGRAPHY
Effects of noise on sleep of babies --- prenatal aircraft noise effects
A77-41875

ELECTRORETINOGRAPHY
Increment spectral sensitivities of the primate late receptor potential and b-wave --- in retinal color processing
A77-42866

ENERGY CONSUMPTION
A metabolic rate prediction model for manual materials handling jobs
N77-29749

ENVIRONMENT POLLUTION
Inefficiency of sanitation measures aboard commercial aircraft - Environmental pollution and disease
A77-42142

ENVIRONMENTAL CONTROL
Dynamic control of space cabin environmental parameters
A77-41073
A preliminary investigation of the Environmental Control and Life Support Subsystem (EC/LSS) for the space construction base manufacturing modules
[NASA-TM-78123] N77-29788

ENZYME ACTIVITY
Effects of hyperoxia on glutathione reductase activity, membrane proteins, and esterases of rabbit erythrocytes
A77-42141

EPIDEMIOLOGY
Review of epidemiology in clinical cardiology
A77-42143

EPINEPHRINE
The effect of some catecholamines on pulmonary circulation
A77-40883

EQUIPMENT SPECIFICATIONS
Human factors and diving equipment design
[AD-A040110] N77-28749

ERYTHROCYTES
The electrolyte content in the blood of animals and transport of potassium-ion erythrocytes under a constant magnetic field
A77-41075
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416
Effects of hyperoxia on glutathione reductase activity, membrane proteins, and esterases of rabbit erythrocytes
A77-42141

ETHYL ALCOHOL
Total body water and lean body mass estimated by ethanol dilution
A77-41813
Voluntary eye movements and alcohol
A77-42135

EUROPE
Industrial robots in Europe - market, applications and developments
N77-29777

EVAPORATIVE COOLING
Effect of evaporative surface cooling on thermographic assessment of burn depth
A77-42239

EXCRETION
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081

EXOBIOLOGY
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639
A model for a non-chemical form of life - Crystalline physiology
A77-43007

EXPERIMENTAL DESIGN
Analysis of human factors engineering experiments: Characteristics, results, and applications
[AD-A038184] N77-29794

EXTRATERRESTRIAL LIFE
A model for a non-chemical form of life - Crystalline physiology
A77-43007
EYE (ANATOMY)
Corneal seal device
[NASA-CASE-LEW-12258-1] N77-28716
EYE DISEASES
Photo- and stereographic methods for studying the disk of the optic nerve
A77-40655
EYE MOVEMENTS
Voluntary eye movements and alcohol
A77-42135
The training of human voluntary torsion: Tonic and dynamic cycloversion
N77-29733

F

FATS
Thyroid cold acclimation influences on norepinephrine metabolism in brown fat
A77-42180
FEASIBILITY ANALYSIS
Assessment of a prototype human resources data handbook for systems engineering
[AD-A039269] N77-28726
FEEDBACK
Force feedback systems in undersea manipulator applications
N77-29775
FIBRINOGEN
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man
A77-41816
FIBROBLASTS
Stabilization studies on human interferon
[PB-264824/0] N77-28724
FINGERS
Design for a three-fingered hand --- robotic and prosthetic applications
A77-43647
FIRES
Fire injuries and the pathology and neuropathology of single acute exposures to combustion products - Pathology and neuropathology of aircraft fire victims
A77-40942
FIRST AID
Accidental hypothermia - An experimental study of practical rewarming methods
A77-42138
FLIGHT CONDITIONS
Psychological aspects of spatial orientation problems in pilots
A77-40658
FLIGHT CREWS
Thermal data from helicopters operating in a sub-arctic environment
A77-42140
Specimen size-rolls for aircrew headgear based on an analysis of the head measurements of 2000 Royal Air Force aircrew
[ARC-R/M-3774] N77-28735
FLIGHT FITNESS
Organization and operation of civil aviation medicine in the Soviet Union
A77-42144
FLIGHT STRESS (BIOLOGY)
Functional shifts in parachute jumps by beginning and experienced parachutists
A77-40656
Protracted radiation-stressed primate performance
A77-42133
FLIGHT TRAINING
E-2 C systems approach to training. Phase 1
[AD-A036264] N77-28748
FLUORIDES
Screening study to identify phase change coolants for portable life support systems
[AD-A038504] N77-28737
FORCE
Force feedback systems in undersea manipulator applications
N77-29775

FOSSILS
Identification of 180 million years old, probably unchanged melanine
[NASA-TM-75132] N77-29729
FREQUENCY MEASUREMENT
On the practical utility of critical flicker fusion frequency measurements to the assessment of mental workload
[ESA-TT-398] N77-29747
FROGS
Electron microscope investigations of the effect of five-day weightlessness simulation on the development of the frog embryo (rana temporaria) vestibular organ
[ESA-TT-397] N77-29732

G

GAMMA RAYS
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081
GAS MIXTURES
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790
Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man
A77-41818
GENETICS
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795
GEOTROPISM
Gravitation and the living organism --- Russian book
A77-41652
Effects of increased gravity force on nutations of sunflower hypocotyls
A77-43016
GLYCOGENS
Neural control of glycogen content and its diurnal rhythm in mouse pineal cell
A77-42181
GRATINGS (SPECTRA)
Hysteresis binocular grating perception - Contrast effects
A77-42870
Temporal studies with flashed gratings - Inferences about human transient and sustained channels
A77-42872
GRAVITATIONAL EFFECTS
Gravitation and the living organism --- Russian book
A77-41652
Effects of increased gravity force on nutations of sunflower hypocotyls
A77-43016

H

HAND (ANATOMY)
Design for a three-fingered hand --- robotic and prosthetic applications
A77-43647
Circulatory and local muscle response to static mutual work
N77-29736
Design for a three-fingered hand
N77-29761
HANDBOOKS
Assessment of a prototype human resources data handbook for systems engineering
[AD-A039269] N77-28726
Health and safety guide for plumbing, heating, and air conditioning contractors
[PB-266409/2] N77-29796
HANDEDNESS
On the origin of biological chirality via natural beta-decay
A77-43005
HANDICAPS
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784

Design and control of a manipulator for tetraplegics
N77-29785

HAWAII
Alga growth potential of waste water effluents in Hawaiian receiving waters
[PB-265172/7] N77-28715

HEAD (ANATOMY)
Numerical prediction of head/neck response to shock-impact
A77-42567
An anthropometric survey of 500 Royal Air Force aircrew heads, 1972
[ARC-R/M-3773] N77-28723
Specimen size-rolls for aircrew headgear based on an analysis of the head measurements of 2000 Royal Air Force aircrew
[ARC-R/M-3774] N77-28735

HEART DISEASES
Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade --- in Spontaneously Hypertensive Rats
A77-42185
Left precordial isopotential mapping during supine exercise
A77-42394
Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries
A77-42395
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397
Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations
A77-43724
Diagnosis of myocardial infarction - Historical notes from the Soviet Union and the United States
A77-43725
Evaluation and interpretation of the EKG /2nd revised edition/ --- German book
A77-43876
Pitfalls and limitations of M-mode echocardiography
A77-44175

HEART FUNCTION
Ejection pressure and the diastolic left ventricular pressure-volume relation
A77-42182
Interaction of aortic pressure and left ventricular end-diastolic pressure in the dog
A77-42187
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension
A77-42993
Pitfalls and limitations of M-mode echocardiography
A77-44175

HEART RATE
Determination of pulse rate variations caused by a stimulus --- heart response to acoustic stimuli
A77-40660
A portable heart rate distribution recorder for studying daily physical activity
A77-40661

HEART VALVES
Pitfalls and limitations of M-mode echocardiography
A77-44175
The role of potassium in the control of the coronary circulation: Mechanism of action and time course
N77-28719

HEAT ACCLIMATIZATION
Carbohydrate and fat metabolism of unacclimatized men during and after submaximal exercise in cool and hot environments
A77-40662

HEAT TRANSFER COEFFICIENTS
Convective and radiative heat transfer coefficients for the human body
A77-41748

HELICOPTERS
Thermal data from helicopters operating in a sub-arctic environment
A77-42140

HELIUM-OXYGEN ATMOSPHERES
Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man
A77-41818

HELMETS
Mass spectroscopic analysis of polyether and polyurethane foam plastics degeneration in the SPH-4 helmet
[AD-A036447] N77-28744

HEMATOPOIESIS
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076

HEMODYNAMIC RESPONSES
Characterization of regional circulation and vasomotor regulation after a two-month space flight
A77-41066
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067
Changes in the orthostatic stability of cosmonauts after space flights of 2 to 63 days' duration
A77-41068

HEMODYNAMICS
The effect of some catecholamines on pulmonary circulation
A77-40883

HIGH ALTITUDE TESTS
Effects of growth, diving history, and high altitude on blood oxygen capacity in harbor seals
A77-41815

HISTOCHEMICAL ANALYSIS
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070

HORMONES
Antibodies to the entire synthetic gastrin molecule in the blood of healthy humans
A77-40884
Prolonged weightlessness effect on postflight plasma thyroid hormones
A77-42132

HUMAN BODY
Engineering models of the human thermoregulatory system - A review
A77-41950

HUMAN FACTORS ENGINEERING
Information processing of dot matrix displays
[AD-A036668] N77-28731
Color coding effects on human performance: An annotated bibliography
[AD-A039318] N77-28732
System modeling and simulation: Application of a research methodology and test
N77-28733
Impact loads produced by human motion. Part 1: background and experimental investigation
[PB-264950/7] N77-28739
Evaluation of V-51 and EAR (trademark) earplugs for use in flight
[AD-A038414] N77-28741
Effects of encumbering clothing, personal-protective equipment and restraints on body size and arm-reach capability of USAF aircrewmen
[AD-A036682] N77-28746
Human factors and diving equipment design
[AD-A040110] N77-28749
Task components and demands as factors in dual-task performance
[AD-A038634] N77-29748
Lunar rover vehicle - an implication for rehabilitation
N77-29786
Application of tracking tasks in ergonomic studies
[PB-23] N77-29790
Analysis of human factors engineering experiments: Characteristics, results, and applications
[AD-A038184] N77-29794

HUMAN PATHOLOGY
Fire injuries and the pathology and neuropathology of single acute exposures to combustion products - Pathology and neuropathology of aircraft fire victims
A77-40942
Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus
A77-41225

HUMAN PERFORMANCE
Study of color vision by the method of recording induced potentials A77-41152
Is the method for 'perception time' measurement adequate --- optical tracking A77-41230
Intellectual performance under stress [AD-A038196] N77-28743
A phase plane approach to study the adaptive nature of a human performing a tracking task [AD-A036223] N77-28747
Circulatory and local muscle response to static mutual work N77-29736
Task components and demands as factors in dual-task performance [AD-A038634] N77-29748
HUMAN REACTIONS
Effects of fatiguing isometric and isotonic exercise on resisted and unresisted reaction time components A77-40659
Determination of pulse rate variations caused by a stimulus --- heart response to acoustic stimuli A77-40660
The use of an intensity matching technique to evaluate human response to whole-body vibration A77-41457
The evaluation of discomfort produced by multiple frequency whole-body vibration A77-41458
Effects of noise on sleep of babies --- prenatal aircraft noise effects A77-41875
Arousal from sleep - The physiological and subjective effects of a 15 dB/A/ reduction in aircraft flyover noise A77-42134
The training of human voluntary torsion: Tonic and dynamic cycloversion N77-29733
HUMAN RESOURCES
Assessment of a prototype human resources data handbook for systems engineering [AD-A039269] N77-28726
HUMAN TOLERANCES
Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects A77-41151
The evaluation of discomfort produced by multiple frequency whole-body vibration A77-41458
HUMAN WASTES
Inefficiency of sanitation measures aboard commercial aircraft - Environmental pollution and disease A77-42142
HYDRAULIC EQUIPMENT
An underwater work systems package --- remote handling N77-29774
HYDROPONICS
Microflora associated with beets during their growth in prolonged hydroponic cultivation A77-41077
HYPERCAPNIA
Defensive reactions of the organism when breathing elevated CO2 concentrations A77-41080
HYPEROXIA
The combined effect of ultrashort-wave irradiation and hyperoxia on animals A77-40657
Effects of hyperoxia on glutathione reductase activity, membrane proteins, and esterases of rabbit erythrocytes A77-42141
HYPERTENSION
Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade --- in Spontaneously Hypertensive Rats A77-42185
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients A77-42413
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension A77-42993
Computer-aided differential diagnosis of hypertension N77-29737
HYPOBARIC ATMOSPHERES
Sleep at altitude A77-42136
Cardiac output during sleep at altitude A77-42137
HYPOKINESIA
Mucopolysaccharides and collagen in tissues of hypokinetic rats A77-41071
HYPOTHERMIA
Accidental hypothermia - An experimental study of practical rewarming methods A77-42138
HYPOXIA
EEG correlates of the quality of work of an operator during different functional states A77-41153
Sleep at altitude A77-42136
Cardiac output during sleep at altitude A77-42137
HYSTERESIS
Hysteresis binocular grating perception - Contrast effects A77-42870

I

ICE
The development of portable coolers for the liquid conditioned suit [ARC-CP-1330] N77-28734
IMAGE CONTRAST
Hysteresis binocular grating perception - Contrast effects A77-42870
IMAGE ENHANCEMENT
Gray-level transformations for interactive image enhancement. N77-29758
IMAGERY
Digital color image processing and psychophysics within the framework of a human visual model [AD-A039007] N77-29742
IMAGING TECHNIQUES
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation A77-40671
Development of high-resolution ultrasonic imaging techniques for detection and clinical assessment of cardiovascular disease [PB-265728/6] N77-28730
IMPACT LOADS
Impact loads produced by human motion. Part 1: background and experimental investigation [PB-264950/7] N77-28739
IMPACT PREDICTION
Numerical prediction of head/neck response to shock-impact A77-42567
INDUSTRIAL PLANTS
Designing robots for industrial environments --- economic factors and vulnerability N77-29778
INDUSTRIAL SAFETY
Inorganic arsenic [PB-266182/5] N77-29744
Sulfur dioxide [PB-266160/1] N77-29745
Health and safety guide for plumbing, heating, and air conditioning contractors [PB-266409/2] N77-29796
INDUSTRIES
Industrial robots in Europe - market, applications and developments N77-29777
INERTIA
Inertia forces in robots and manipulators N77-29764

INFORMATION MANAGEMENT
Information processing of dot matrix displays
[AD-A036668] N77-28731
INFORMATION SYSTEMS
A psychophysical analysis of complex integrated displays
[AD-A039260] N77-28727
INFORMATION THEORY
Information and control issues of adaptable-programmable assembly systems for manufacturing and teleoperator applications
N77-29780
INFRARED DETECTORS
Proximity sensor technology for manipulator end effectors --- hand mounted IR device to detect nearby objects
A77-43648
INFRARED SPECTROSCOPY
Identification of 180 million years old, probably unchanged melanine
[NASA-TM-75132] N77-29729
INORGANIC COMPOUNDS
The role of inorganic phosphate in oxygen transport
[AD-A038769] N77-29741
INSPECTION
Topics in programmable automation --- for materials handling, inspection, and assembly
N77-29779
INTEGRATORS
A portable heart rate distribution recorder for studying daily physical activity
A77-40661
INTELLIGIBILITY
Development and validation of an equation for predicting the comprehensibility of textural material
[AD-A040755] N77-29789
INTERFERON
Stabilization studies on human interferon
[PB-264824/4] N77-28724
IONIZING RADIATION
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795
ISCHEMIA
K-42 exchange during myocardial ischemia
A77-42183
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184
Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations
A77-43724

L

LASER RANGE FINDERS
Interactive handling of TV and range data for remotely controlled systems
N77-29759
LEAD (METAL)
Health effects of occupational lead and arsenic exposure
[PB-266213/8] N77-29746
LENGTH
Is perceived length affected by interactions between orientation detectors --- visual illusion from randomly orientated shapes
A77-42869
LEUKOCYTES
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416
LIFE SCIENCES
A model for a non-chemical form of life - Crystalline physiology
A77-43007
Definition study for Spacelab experiments in the field of basic medicine and process engineering
[ESA-TT-391] N77-29740
LIFE SUPPORT SYSTEMS
A preliminary investigation of the Environmental Control and Life Support Subsystem (EC/LSS) for the space construction base manufacturing modules
[NASA-TM-78123] N77-29788
LIGHT ADAPTATION
Long-lasting afterimages caused by neural adaptation
A77-42871
LIMBS (ANATOMY)
System integration of pattern recognition, adaptive aided, upper limb prostheses
N77-29782
LINEAR SYSTEMS
Linear models for man as controller
[PB-24] N77-29791
LIPID METABOLISM
Carbohydrate and fat metabolism of unacclimatized men during and after submaximal exercise in cool and hot environments
A77-40662
Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations
A77-43724
LIPOPROTEINS
Collaborative US-USSR study on the prevalence of dyslipoproteinemias and ischemic heart disease in American and Soviet populations
A77-43724
LOCOMOTION
Parametric optimization in the problem of biped locomotion
A77-43279
LUNAR ROVING VEHICLES
Lunar rover vehicle - an implication for rehabilitation
N77-29786
LUNG MORPHOLOGY
Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man
A77-41818

M

MACHINING
An underwater work systems package --- remote handling
N77-29774
MAGNETIC EFFECTS
The electrolyte content in the blood of animals and transport of potassium-ion erythrocytes under a constant magnetic field
A77-41075
MAGNETIC FIELDS
The electrolyte content in the blood of animals and transport of potassium-ion erythrocytes under a constant magnetic field
A77-41075
MAN MACHINE SYSTEMS
Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications
A77-43643
A unit task simulator for the evaluation of interactive man-computer systems
[PB-265097/6] N77-28738
Current theories of man-machine systems
N77-29751
The human controller in car following
N77-29753
Control automation in undersea manipulation systems
N77-29776
Linear models for man as controller
[PB-24] N77-29791
MANEUVERABILITY
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784
MANIPULATORS
Robots and manipulator systems; Proceedings of the Second Conference on Remotely Manned Systems, Los Angeles, Calif., June 9-11, 1975
A77-43641
The LEMMA concept - A new manipulator --- laboratory mechanical arm
A77-43646
Proximity sensor technology for manipulator end effectors --- hand mounted IR device to detect nearby objects
A77-43648
Effect of hand-based sensors on manipulator control performance
N77-29755
Location and acquisition of objects in unpredictable locations --- a teleoperator system with a computer for manipulator control
N77-29756

TV requirements for manipulation in space
N77-29757
Proximity sensor technology for manipulator end effectors
N77-29760
Design for a three-fingered hand
N77-29761
The LEMSA concept: A new manipulator
N77-29762
Manipulator system performance measurement
N77-29763
Inertia forces in robots and manipulators
N77-29764
The assembly of large structures in space --- radio astronomy telescope and microwave antenna
N77-29770
Control and stability problems of remote orbital capture
N77-29771
Force feedback systems in undersea manipulator applications
N77-29775
Control automation in undersea manipulation systems
N77-29776
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784
Design and control of a manipulator for tetraplegics
N77-29785
New control concept of anthropomorphic manipulators
N77-29787
Manipulator development at the Naval Undersea Center
[AD-A038449]
N77-29795

MANNED SPACE FLIGHT
Psychological issues in manned spaceflight
A77-41787

MANUAL CONTROL
A survey of piloting factors in fixed-wing V/STOL aircraft
[AIAA 77-1147]
A77-43177
An investigation of supervisory control of remote manipulation
A77-43642
Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications
A77-43643
Linear models for man as controller
[PB-24]
N77-29791

MANUFACTURING
Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications
A77-43643
Information and control issues of adaptable-programmable assembly systems for manufacturing and teleoperator applications
N77-29780

MARKET RESEARCH
Industrial robots in Europe - market, applications and developments
N77-29777

MARS SURFACE
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639

MASKS
Optical properties and visual effects of face masks
[AD-A038197]
N77-28742

MATERIALS HANDLING
Industrial robots in Europe - market, applications and developments
N77-29777

MATHEMATICAL MODELS
Engineering models of the human thermoregulatory system - A review
A77-41950
System modeling and simulation: Application of a research methodology and test
N77-28733
Stochastic modelling of remotely manned systems
N77-29752

MECHANICAL DRIVES
The LEMSA concept - A new manipulator --- laboratory mechanical arm
A77-43646
Design for a three-fingered hand --- robotic and prosthetic applications
A77-43647

MEDICAL ELECTRONICS
Computer-based system for analysis of respiratory responses to exercise
A77-41821
New trends in phonocardiograph modulators
A77-43325

MEDICAL EQUIPMENT
Corneal seal device
[NASA-CASE-LEW-12258-1]
N77-28716
Snap-in compressible biomedical electrode
[NASA-CASE-MSC-14623-1]
N77-28717

MEDICAL SCIENCE
Definition study for Spacelab experiments in the field of basic medicine and process engineering
[ESA-TT-391]
N77-29740

MEDICAL SERVICES
Necessary medical and paramedical measures for an airport catastrophe
A77-40949

MELANIN
Identification of 180 million years old, probably unchanged melanine
[NASA-TM-75132]
N77-29729

MENTAL PERFORMANCE
Intellectual performance under stress
[AD-A038196]
N77-28743

METABOLIC WASTES
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081

METABOLISM
A metabolic rate prediction model for manual materials handling jobs
N77-29749

METHANE
A statistical study of grab sampling in a closed environment
[AD-A036666]
N77-28745

METHYL COMPOUNDS
Interaction between methyl mercury and radiation effects on nervous systems
[PB-265873/0]
N77-28728

MICROBIOLOGY
Microflora associated with beets during their growth in prolonged hydroponic cultivation
A77-41077

MICROHARDNESS
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065

MICROORGANISMS
Microflora associated with beets during their growth in prolonged hydroponic cultivation
A77-41077

MICROWAVE ANTENNAS
The assembly of large structures in space --- radio astronomy telescope and microvave antenna
N77-29770

MICROWAVE EMISSION
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416

MICROWAVE FREQUENCIES
The combined effect of ultrashort-wave irradiation and hyperoxia on animals
A77-40657

MINERALOGY
The role of mineral surfaces in the origin of life
A77-43006

MODULATORS
New trends in phonocardiograph modulators
A77-43325

MOISTURE CONTENT
Total body water and lean body mass estimated by ethanol dilution
A77-41813

MOLECULAR BIOLOGY
On the origin of biological chirality via natural beta-decay
A77-43005

MOLECULAR STRUCTURE
On the origin of biological chirality via natural beta-decay
A77-43005

MOTION PERCEPTION
Is the method for 'perception time' measurement adequate --- optical tracking
A77-41230

MOTION SICKNESS
Motion sickness - An evolutionary hypothesis
A77-41640
Some psychological correlates of motion sickness susceptibility
A77-42131
MOTION STABILITY
Control and stability problems of remote orbital capture
A77-43644
MUSCLES
The dynamic function of selected muscles of the forearm: An electromyographical and cinematographical analysis
N77-28718
MUSCULAR FATIGUE
Effects of fatiguing isometric and isotonic exercise on resisted and unresisted reaction time components
A77-40659
MUSCULAR FUNCTION
Capillary supply of skeletal muscle fibers in untrained and endurance-trained men
A77-42188
Modeling of the thermophysical processes accompanying muscle contraction in humans
A77-44001
MUSCULOSKELETAL SYSTEM
Capillary supply of skeletal muscle fibers in untrained and endurance-trained men
A77-42188
MUTATIONS
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795
MYOCARDIAL INFARCTION
The combined effect of ultrashort-wave irradiation and hyperoxia on animals
A77-40657
Exercise testing in the diagnosis of coronary heart disease - A perspective
A77-43723
Diagnosis of myocardial infarction - Historical notes from the Soviet Union and the United States
A77-43725
MYOCARDIUM
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671
K-42 exchange during myocardial ischemia
A77-42183
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184

N

NAUSEA
Motion sickness - An evolutionary hypothesis
A77-41640
NAVY
E-2 C systems approach to training. Phase 1 [AD-A036264]
N77-28748
NECK (ANATOMY)
Numerical prediction of head/neck response to shock-impact
A77-42567
NERVES
Formation of additional nerve connections of the common carotid artery
A77-41224
NERVOUS SYSTEM
Interaction between methyl mercury and radiation effects on nervous systems [PB-265873/0]
N77-28728
NETWORK SYNTHESIS
New trends in phonocardiograph modulators
A77-43325
NEUROLOGY
Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts
A77-41069
NEURONS
The effect of decimeter waves on central cerebral structures
A77-40882
NEUROPHYSIOLOGY
Photo- and stereographic methods for studying the disk of the optic nerve
A77-40655
Formation of additional nerve connections of the common carotid artery
A77-41224
Neural control of glycogen content and its diurnal rhythm in mouse pineal cell
A77-42181
NITRIC OXIDE
Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats
A77-42405
NITROGEN DIOXIDE
Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats
A77-42405
NOISE REDUCTION
Arousal from sleep - The physiological and subjective effects of a 15 dB/A/ reduction in aircraft flyover noise
A77-42134
NORADRENALINE
The effect of some catecholamines on pulmonary circulation
A77-40883
NOREPINEPHRINE
Thyroid cold acclimation influences on norepinephrine metabolism in brown fat
A77-42180
NOSE (ANATOMY)
An analysis of the contribution of small airways to lower airway resistance
N77-28720
NUTATION
Effects of increased gravity force on nutations of sunflower hypocotyls
A77-43016
NUTATION DAMPERS
Control and stability problems of remote orbital capture
N77-29771
NYSTAGMUS
Method of photoelectric nystagmography
A77-40738

O

OCEANOGRAPHY
An overview of underwater remotely manned Systems and sub-systems
N77-29773
An underwater work systems package --- remote handling
N77-29774
ONTOGENY
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416
OPERATOR PERFORMANCE
Psychopharmacology in aviation and astronautics
A77-41064
EEG correlates of the quality of work of an operator during different functional states
A77-41153
Human performance and transmissibility under sinusoidal and mixed vertical vibration
A77-41456
An investigation of supervisory control of remote manipulation
A77-43642
The human controller in car following
N77-29753
Application of tracking tasks in ergonomic studies [PB-23]
N77-29790
OPHTHALMOLOGY
Method of photoelectric nystagmography
A77-40738
OPTICAL DATA PROCESSING
Digital color image processing and psychophysics within the framework of a human visual model [AD-A039007]
N77-29742
OPTICAL ILLUSION
Is perceived length affected by interactions between orientation detectors --- visual illusion from randomly orientated shapes
A77-42869

OPTICAL PROPERTIES
Optical properties and visual effects of face masks [AD-A038197] N77-28742
OPTICAL TRACKING
Is the method for 'perception time' measurement adequate --- optical tracking A77-41230
Application of tracking tasks in ergonomic studies [PB-23] N77-29790
OPTICAL WAVEGUIDES
Method of photoelectric nystagmography A77-40738
OPTIMAL CONTROL
Parametric optimization in the problem of biped locomotion A77-43279
OPTOMETRY
Photo- and stereographic methods for studying the disk of the optic nerve A77-40655
ORBITAL ASSEMBLY
Space tug spacecraft/module exchanger (on-orbit servicer) N77-29768
The assembly of large structures in space --- radio astronomy telescope and microwave antenna N77-29770
ORBITAL RENDEZVOUS
Control and stability problems of remote orbital capture N77-29771
ORTHOSTATIC TOLERANCE
Circulation studies during LBNP aboard the orbital station Salyut-4 A77-41067
Changes in the orthostatic stability of cosmonauts after space flights of 2 to 63 days' duration A77-41068
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man A77-41072
Fastigial nucleus and orthostatic reflex in cat and monkey A77-42186
OTOLITH ORGANS
Function of the otolithic apparatus of cosmonauts following space flight A77-41082
OXYGEN
The role of inorganic phosphate in oxygen transport [AD-A038769] N77-29741
OXYGEN CONSUMPTION
Validity and reliability of pedometers in habitual activity research A77-40664
Dynamic control of space cabin environmental parameters A77-41073
Technology for the development of a portable metabolic monitor [PB-266215/3] N77-29743
OXYGEN METABOLISM
Technology for the development of a portable metabolic monitor [PB-266215/3] N77-29743
OXYGEN REGULATORS
Oxygen regulator performance during decompression [AD-A038415] N77-29793
OZONE
Effects of atmospheric pollutants on human physiologic function [PB-265846/6] N77-28729

P

PARACHUTE DESCENT
Functional shifts in parachute jumps by beginning and experienced parachutists A77-40656
PARALYSIS
Design and control of a manipulator for tetraplegics N77-29785
Lunar rover vehicle - an implication for rehabilitation N77-29786
PASSENGER AIRCRAFT
Inefficiency of sanitation measures aboard commercial aircraft - Environmental pollution and disease A77-42142
PATTERN RECOGNITION
Detection and discrimination of simple and complex patterns at low spatial frequencies --- visual waveform perception A77-42868
System integration of pattern recognition, adaptive aided, upper limb prostheses N77-29782
PEPTIDES
Antibodies to the entire synthetic gastrin molecule in the blood of healthy humans A77-40884
PERCEPTUAL TIME CONSTANT
Is the method for 'perception time' measurement adequate --- optical tracking A77-41230
PERFORMANCE
Manipulator system performance measurement N77-29763
PERIPHERAL CIRCULATION
Features of the cerebral and peripheral blood circulation in healthy people of different ages A77-41154
PERSONALITY TESTS
Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts A77-41069
Some psychological correlates of motion sickness susceptibility A77-42131
PHARMACOLOGY
Psychopharmacology in aviation and astronautics A77-41064
Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade --- in Spontaneously Hypertensive Rats A77-42185
PHONOCARDIOGRAPHY
New trends in phonocardiograph modulators A77-43325
PHOSPHATES
The role of mineral surfaces in the origin of life A77-43006
The role of inorganic phosphate in oxygen transport [AD-A038769] N77-29741
PHOTORECEPTORS
Increment spectral sensitivities of the primate late receptor potential and b-wave --- in retinal color processing A77-42866
PHOTOSENSITIVITY
Increment spectral sensitivities of the primate late receptor potential and b-wave --- in retinal color processing A77-42866
Visual capacities of the owl monkey /Aotus trivirgatus/. I - Spectral sensitivity and color vision. II - Spatial contrast sensitivity A77-42867
PHYSICAL EXERCISE
Effects of fatiguing isometric and isotonic exercise on resisted and unresisted reaction time components A77-40659
Carbohydrate and fat metabolism of unacclimatized men during and after submaximal exercise in cool and hot environments A77-40662
Exercise effects on the time of reactions to auditory stimuli A77-40663
Validity and reliability of pedometers in habitual activity research A77-40664
Respiratory mechanics during speech in the course of static physical exercise A77-41074
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man A77-41816
Dynamic and steady-state respiratory responses to bicycle exercise A77-41820

Computer-based system for analysis of respiratory responses to exercise
A77-41821
Left precordial isopotential mapping during supine exercise
A77-42394
Exercise testing in the diagnosis of coronary heart disease - A perspective
A77-43723

PHYSICAL FITNESS
Assessment of maximal aerobic power in specifically trained athletes
A77-41814
Thermoregulatory responses during competitive marathon running
A77-41819
Capillary supply of skeletal muscle fibers in untrained and endurance-trained men
A77-42188

PHYSIOLOGICAL DEFENSES
Defensive reactions of the organism when breathing elevated CO2 concentrations
A77-41080

PHYSIOLOGICAL EFFECTS
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081
Effects of atmospheric pollutants on human physiologic function
[PB-265846/6] N77-28729

PHYSIOLOGICAL RESPONSES
Functional shifts in parachute jumps by beginning and experienced parachutists
A77-40656
Determination of pulse rate variations caused by a stimulus --- heart response to acoustic stimuli
A77-40660
Exercise effects on the time of reactions to auditory stimuli
A77-40663
Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires - The assessment of the human survival response during aircraft accidents
A77-40945
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065
Mucopolysaccharides and collagen in tissues of hypokinetic rats
A77-41071
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man
A77-41072
Respiratory mechanics during speech in the course of static physical exercise
A77-41074
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078
Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects
A77-41151
Dynamic and steady-state respiratory responses to bicycle exercise
A77-41820
Voluntary eye movements and alcohol
A77-42135
Accidental hypothermia - An experimental study of practical rewarming methods
A77-42138
Fastigial nucleus and orthostatic reflex in cat and monkey
A77-42186
Circulatory and local muscle response to static mutual work
N77-29736

PHYSIOLOGICAL TESTS
The effect of experimentally-induced generalized convulsions on the cycle of wakefulness and sleep
A77-40881
Characterization of regional circulation and vasomotor regulation after a two-month space flight
A77-41066
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067
Changes in the orthostatic stability of cosmonauts after space flights of 2 to 63 days' duration
A77-41068
Assessment of maximal aerobic power in specifically trained athletes
A77-41814
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man
A77-41816
Limits on Va/Q distributions from analysis of experimental inert gas elimination --- ventilation-perfusion ratios
A77-41817
Thermoregulatory responses during competitive marathon running
A77-41819
Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol
A77-42139
Echocardiographic assessment of a normal adult aging population
A77-42396

PILOT PERFORMANCE
Psychological aspects of spatial orientation problems in pilots
A77-40658
A survey of piloting factors in fixed-wing V/STOL aircraft
[AIAA 77-1147] A77-43177
The peacetime evaluation of the pilot skill factor in air-to-air combat
[AD-A039880] N77-29792

PILOT TRAINING
The peacetime evaluation of the pilot skill factor in air-to-air combat
[AD-A039880] N77-29792

PILOTLESS AIRCRAFT
Remotely piloted aircraft in the civil environment
N77-29772

PINEAL GLAND
Neural control of glycogen content and its diurnal rhythm in mouse pineal cell
A77-42181

PLANTS (BOTANY)
Effects of increased gravity force on nutations of sunflower hypocotyls
A77-43016

POLYETHER RESINS
Mass spectroscopic analysis of polyether and polyurethane foam plastics degeneration in the SPH-4 helmet
[AD-A036447] N77-28744

POLYURETHANE FOAM
Mass spectroscopic analysis of polyether and polyurethane foam plastics degeneration in the SPH-4 helmet
[AD-A036447] N77-28744

PORTABLE EQUIPMENT
A portable heart rate distribution recorder for studying daily physical activity
A77-40661
The development of portable coolers for the liquid conditioned suit
[AEC-CP-1330] N77-28734

PORTABLE LIFE SUPPORT SYSTEMS
Screening study to identify phase change coolants for portable life support systems
[AD-A038504] N77-28737

POSTFLIGHT ANALYSIS
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078

POTASSIUM
The electrolyte content in the blood of animals and transport of potassium-ion erythrocytes under a constant magnetic field
A77-41075
The role of potassium in the control of the coronary circulation: Mechanism of action and time course
N77-28719

POTASSIUM ISOTOPES
K-42 exchange during myocardial ischemia
A77-42183

PREDICTION ANALYSIS TECHNIQUES
A metabolic rate prediction model for manual materials handling jobs
N77-29749
PRESSURE REDUCTION
An analysis of the contribution of small airways to lower airway resistance
N77-28720
Oxygen regulator performance during decompression
[AD-A038415] N77-29793
PRODUCTION ENGINEERING
Designing robots for industrial environments --- economic factors and vulnerability
N77-29778
PRODUCTION MANAGEMENT
A unit task simulator for the evaluation of interactive man-computer systems
[PB-265097/6] N77-28738
PROPHYLAXIS
The blood coagulation system during a 12-day immersion in water and the prophylactic role of rotation in a centrifuge
A77-41079
PROSTHETIC DEVICES
Design for a three-fingered hand --- robotic and prosthetic applications
A77-43647
System integration of pattern recognition, adaptive aided, upper limb prostheses
N77-29782
Application of a postulate based control theory for an artificial arm
N77-29783
PROTEINS
Antibodies to the entire synthetic gastrin molecule in the blood of healthy humans
A77-40884
Effects of hyperoxia on glutathione reductase activity, membrane proteins, and esterases of rabbit erythrocytes
A77-42141
PROTHROMBIN
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man
A77-41816
PROTON IRRADIATION
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076
PSYCHOACOUSTICS
The effect of the acoustic reflex on the perception of speech in noise
N77-29734
PSYCHOLOGICAL FACTORS
Psychological aspects of spatial orientation problems in pilots
A77-40658
Psychological issues in manned spaceflight
A77-41787
Some psychological correlates of motion sickness susceptibility
A77-42131
PSYCHOLOGICAL TESTS
Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts
A77-41069
PSYCHOMETRICS
Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts
A77-41069
On the practical utility of critical flicker fusion frequency measurements to the assessment of mental workload
[ESA-TT-398] N77-29747
Analysis of human factors engineering experiments: Characteristics, results, and applications
[AD-A038184] N77-29794
PSYCHOPHYSICS
Psychophysical experiments on spatial summation at threshold level of the human peripheral retina
A77-42873
A psychophysical analysis of complex integrated displays
[AD-A039260] N77-28727
Digital color image processing and psychophysics within the framework of a human visual model
[AD-A039007] N77-29742
PSYCHOPHYSIOLOGY
Some psychological correlates of motion sickness susceptibility
A77-42131
PUBLIC HEALTH
Effects of atmospheric pollutants on human physiologic function
[PB-265846/6] N77-28729
PULMONARY CIRCULATION
The effect of some catecholamines on pulmonary circulation
A77-40883
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients
A77-42813
Pitfalls and limitations of M-mode echocardiography
A77-44175
PULMONARY FUNCTIONS
An analysis of the contribution of small airways to lower airway resistance
N77-28720
PULSE RATE
Determination of pulse rate variations caused by a stimulus --- heart response to acoustic stimuli
A77-40660

R

RADIATION DOSAGE
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076
RADIATION EFFECTS
The combined effect of ultrashort-wave irradiation and hyperoxia on animals
A77-40657
The effect of decimeter waves on central cerebral structures
A77-40882
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081
Interaction between methyl mercury and radiation effects on nervous systems
[PB-265873/0] N77-28728
RADIATION INJURIES
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076
RADIATION PROTECTION
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790
RADIATION SHIELDING
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076
RADIATION SICKNESS
Protracted radiation-stressed primate performance
A77-42133
RADIATIVE HEAT TRANSFER
Convective and radiative heat transfer coefficients for the human body
A77-41748
RADIOBIOLOGY
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416
RADIOPATHOLOGY
The combined effect of ultrashort-wave irradiation and hyperoxia on animals
A77-40657

Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790

RANDOM SAMPLING
A statistical study of grab sampling in a closed environment
[AD-A036666] N77-28745

RARE GASES
Limits on Va/Q distributions from analysis of experimental inert gas elimination --- ventilation-perfusion ratios
A77-41817

RATES (PER TIME)
A metabolic rate prediction model for manual materials handling jobs
N77-29749

REACTION TIME
Effects of fatiguing isometric and isotonic exercise on resisted and unresisted reaction time components
A77-40659
Exercise effects on the time of reactions to auditory stimuli
A77-40663

RECYCLING
Technology advancement of the electrochemical CO2 concentrating process
[NASA-CR-151995] N77-28736

REFLEXES
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients
A77-42413
The effect of the acoustic reflex on the perception of speech in noise
N77-29734

REMOTE CONTROL
An investigation of supervisory control of remote manipulation
A77-43642
Control and stability problems of remote orbital capture
A77-43644
The LEMMA concept - A new manipulator --- laboratory mechanical arm
A77-43646
Design for a three-fingered hand --- robotic and prosthetic applications
A77-43647
The 2nd conference on Remotely Manned Systems (RMS): Technology and applications
[NASA-CR-148013] N77-29750
Current theories of man-machine systems
N77-29751
An investigation of supervisory control of remote manipulation
N77-29754
Effect of hand-based sensors on manipulator control performance
N77-29755
Interactive handling of TV and range data for remotely controlled systems
N77-29759
On-orbit serviceable satellite design
N77-29766
Orbital servicing, and remotely manned systems
N77-29767
Control and stability problems of remote orbital capture
N77-29771
Information and control issues of adaptable-programmable assembly systems for manufacturing and teleoperator applications
N77-29780
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784

REMOTE HANDLING
An investigation of supervisory control of remote manipulation
N77-29754
TV requirements for manipulation in space
N77-29757
Proximity sensor technology for manipulator end effectors
N77-29760
Design for a three-fingered hand
N77-29761
An overview of underwater remotely manned Systems and sub-systems
N77-29773
An underwater work systems package --- remote handling
N77-29774
Topics in programmable automation --- for materials handling, inspection, and assembly
N77-29779

REMOTE SENSORS
Proximity sensor technology for manipulator end effectors --- hand mounted IR device to detect nearby objects
A77-43648
Interactive handling of TV and range data for remotely controlled systems
N77-29759
Proximity sensor technology for manipulator end effectors
N77-29760

REMOTELY PILOTED VEHICLES
The 2nd conference on Remotely Manned Systems (RMS): Technology and applications
[NASA-CR-148013] N77-29750
Stochastic modelling of remotely manned systems
N77-29752
Orbital servicing, and remotely manned systems
N77-29767
Remotely piloted aircraft in the civil environment
N77-29772
Manipulator development at the Naval Undersea Center
[AD-A038449] N77-29795

REPRODUCTION (BIOLOGY)
Symbiosis and the origin of life
A77-43008

RESCUE OPERATIONS
Necessary medical and paramedical measures for an airport catastrophe
A77-40949

RESPIRATORY PHYSIOLOGY
Respiratory mechanics during speech in the course of static physical exercise
A77-41074
Defensive reactions of the organism when breathing elevated CO2 concentrations
A77-41080
Limits on Va/Q distributions from analysis of experimental inert gas elimination --- ventilation-perfusion ratios
A77-41817
Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man
A77-41818
Dynamic and steady-state respiratory responses to bicycle exercise
A77-41820
Computer-based system for analysis of respiratory responses to exercise
A77-41821
An analysis of the contribution of small airways to lower airway resistance
N77-28720

RESPIRATORY SYSTEM
An analysis of the contribution of small airways to lower airway resistance
N77-28720

RESUSCITATION
Accidental hypothermia - An experimental study of practical rewarming methods
A77-42138

RETINA
Increment spectral sensitivities of the primate late receptor potential and b-wave --- in retinal color processing
A77-42866

RETINAL ADAPTATION
Psychophysical experiments on spatial summation at threshold level of the human peripheral retina
A77-42873

RETINENE
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865

RHEOENCEPHALOGRAPHY
Characterization of regional circulation and vasomotor regulation after a two-month space flight
A77-41066

RHYTHM (BIOLOGY)
EEG correlates of the quality of work of an operator during different functional states
A77-41153
ROBOTS
Robots and manipulator systems; Proceedings of the Second Conference on Remotely Manned Systems, Los Angeles, Calif., June 9-11, 1975
A77-43641
Design for a three-fingered hand --- robotic and prosthetic applications
A77-43647
The 2nd conference on Remotely Manned Systems (RMS): Technology and applications
[NASA-CR-148013] N77-29750
Inertia forces in robots and manipulators
N77-29764
Industrial robots in Europe - market, applications and developments
N77-29777
Designing robots for industrial environments --- economic factors and vulnerability
N77-29778
Topics in programmable automation --- for materials handling, inspection, and assembly
N77-29779
New control concept of anthropomorphic manipulators
N77-29787
ROTATING ENVIRONMENTS
The blood coagulation system during a 12-day immersion in water and the prophylactic role of rotation in a centrifuge
A77-41079
RUNNING
Validity and reliability of pedometers in habitual activity research
A77-40664

S

SAFETY DEVICES
Restraint systems evaluation program
[PB-265562/9] N77-28740
SALTS
Screening study to identify phase change coolants for portable life support systems
[AD-A038504] N77-28737
SANITATION
Inefficiency of sanitation measures aboard commercial aircraft - Environmental pollution and disease
A77-42142
SATELLITE DESIGN
On-orbit serviceable satellite design
N77-29766
SATELLITE ORBITS
Control and stability problems of remote orbital capture
A77-43644
SEA WATER
Alga growth potential of waste water effluents in Hawaiian receiving waters
[PB-265172/7] N77-28715
SENSORY PERCEPTION
Effect of hand-based sensors on manipulator control performance
N77-29755
SEPTUM
Echocardiographic diagnosis of left anterior descending coronary artery disease
A77-40672
K-42 exchange during myocardial ischemia
A77-42183
SERUMS
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078
SHORT WAVE RADIATION
The combined effect of ultrashort-wave irradiation and hyperoxia on animals
A77-40657
SIGNAL PROCESSING
Proximity sensor technology for manipulator end effectors --- hand mounted IR device to detect nearby objects
A77-43648
SKIN TEMPERATURE (BIOLOGY)
Effect of evaporative surface cooling on thermographic assessment of burn depth
A77-42239
SLEEP
The effect of experimentally-induced generalized convulsions on the cycle of wakefulness and sleep
A77-40881
Effects of noise on sleep of babies --- prenatal aircraft noise effects
A77-41875
Arousal from sleep - The physiological and subjective effects of a 15 dB/A/ reduction in aircraft flyover noise
A77-42134
Sleep at altitude
A77-42136
Cardiac output during sleep at altitude
A77-42137
SOFTNESS
Artificial softness sensing - an automatic apparatus for measuring viscoelasticity
N77-29781
SPACE BASES
A preliminary investigation of the Environmental Control and Life Support Subsystem (EC/LSS) for the space construction base manufacturing modules
[NASA-TM-78123] N77-29788
SPACE ENVIRONMENT SIMULATION
Protracted radiation-stressed primate performance
A77-42133
SPACE ERECTABLE STRUCTURES
The assembly of large structures in space --- radio astronomy telescope and microwave antenna
N77-29770
SPACE FLIGHT STRESS
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065
Characterization of regional circulation and vasomotor regulation after a two-month space flight
A77-41066
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067
Changes in the orthostatic stability of cosmonauts after space flights of 2 to 63 days' duration
A77-41068
Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts
A77-41069
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078
Function of the otolithic apparatus of cosmonauts following space flight
A77-41082
Psychological issues in manned spaceflight
A77-41787
SPACE MAINTENANCE
Remote servicing of free-flying spacecraft
N77-29765
On-orbit serviceable satellite design
N77-29766
Orbital servicing, and remotely manned systems
N77-29767
Space tug spacecraft/module exchanger (on-orbit servicer)
N77-29768
A user assessment of servicing at geostationary orbit
N77-29769
SPACE ORIENTATION
Psychological aspects of spatial orientation problems in pilots
A77-40658
SPACE PERCEPTION
Function of the otolithic apparatus of cosmonauts following space flight
A77-41082
Hysteresis binocular grating perception - Contrast effects
A77-42870

SPACE SHUTTLE ORBITERS
Remote servicing of free-flying spacecraft
N77-29765

SPACE SHUTTLES
Control and stability problems of remote orbital capture
A77-43644

SPACE TUGS
Space tug spacecraft/module exchanger (on-orbit servicer)
N77-29768

SPACEBORNE TELESCOPES
The assembly of large structures in space --- radio astronomy telescope and microwave antenna
N77-29770

SPACECRAFT CABIN ATMOSPHERES
Dynamic control of space cabin environmental parameters
A77-41073

SPACECRAFT COMMUNICATION
A case study evaluation of a satellite video telemedicine project in rural Alaska
N77-29735

SPACECRAFT CONTROL
Control and stability problems of remote orbital capture
N77-29771

SPACECRAFT DESIGN
Remote servicing of free-flying spacecraft
N77-29765

SPACECRAFT ENVIRONMENTS
Definition study for Spacelab experiments in the field of basic medicine and process engineering
[ESA-TT-391] N77-29740

SPACECRAFT MODULES
On-orbit serviceable satellite design
N77-29766
Space tug spacecraft/module exchanger (on-orbit servicer)
N77-29768

SPACECRAFT MOTION
Control and stability problems of remote orbital capture
N77-29771

SPACECREWS
Psychological issues in manned spaceflight
A77-41787

SPACELAB
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report --- for Spacelab biological experiments
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731
Definition study for Spacelab experiments in the field of basic medicine and process engineering
[ESA-TT-391] N77-29740

SPEECH
Respiratory mechanics during speech in the course of static physical exercise
A77-41074

SPEECH RECOGNITION
The effect of the acoustic reflex on the perception of speech in noise
N77-29734

STANDARDS
Information processing of dot matrix displays
[AD-A036668] N77-28731

STATIC LOADS
Respiratory mechanics during speech in the course of static physical exercise
A77-41074

STATISTICAL ANALYSIS
Assessment of maximal aerobic power in specifically trained athletes
A77-41814

STEREOPHOTOGRAPHY
Photo- and stereographic methods for studying the disk of the optic nerve
A77-40655

STIMULI
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man
A77-41072

STOCHASTIC PROCESSES
Stochastic modelling of remotely manned systems
N77-29752

STRESS (PHYSIOLOGY)
Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects
A77-41151
EEG correlates of the quality of work of an operator during different functional states
A77-41153

STRESS (PSYCHOLOGY)
Intellectual performance under stress
[AD-A038196] N77-28743

STRUCTURAL MEMBERS
Impact loads produced by human motion. Part 1: background and experimental investigation
[PB-264950/7] N77-28739

SUBMARINES
A statistical study of grab sampling in a closed environment
[AD-A036666] N77-28745

SUBMERGED BODIES
The blood coagulation system during a 12-day immersion in water and the prophylactic role of rotation in a centrifuge
A77-41079

SULFUR DIOXIDES
Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats
A77-42405
Sulfur dioxide
[PB-266160/1] N77-29745

SULFURIC ACID
Toxicological and skin corrosion testing of selected hazardous materials
[PB-264975/4] N77-28725

SUPINE POSITION
Left precordial isopotential mapping during supine exercise
A77-42394

SURFACE REACTIONS
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639

SWITCHING CIRCUITS
New trends in phonocardiograph modulators
A77-43325

SYMBIOSIS
Symbiosis and the origin of life
A77-43008

SYSTEM EFFECTIVENESS
An investigation of supervisory control of remote manipulation
A77-43642

SYSTEMS ENGINEERING
Engineering models of the human thermoregulatory system - A review
A77-41950
Assessment of a prototype human resources data handbook for systems engineering
[AD-A039269] N77-28726
System integration of pattern recognition, adaptive aided, upper limb prostheses
N77-29782

SYSTOLIC PRESSURE
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension
A77-42993

T

TACTILE DISCRIMINATION
Artificial softness sensing - an automatic apparatus for measuring viscoelasticity
N77-29781

TASK COMPLEXITY
Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications
A77-43643

TASKS
Task components and demands as factors in dual-task performance
[AD-A038634] N77-29748

TECHNOLOGY ASSESSMENT
An overview of underwater remotely manned Systems and sub-systems
N77-29773
TECHNOLOGY UTILIZATION
Remotely piloted aircraft in the civil environment
N77-29772
Industrial robots in Europe - market, applications and developments
N77-29777
Lunar rover vehicle - an implication for rehabilitation
N77-29786
TELEOPERATORS
Robots and manipulator systems; Proceedings of the Second Conference on Remotely Manned Systems, Los Angeles, Calif., June 9-11, 1975
A77-43641
An investigation of supervisory control of remote manipulation
A77-43642
Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications
A77-43643
Control and stability problems of remote orbital capture
A77-43644
The LEMMA concept - A new manipulator --- laboratory mechanical arm
A77-43646
Design for a three-fingered hand --- robotic and prosthetic applications
A77-43647
The 2nd conference on Remotely Manned Systems (RMS): Technology and applications
[NASA-CR-148013] N77-29750
Location and acquisition of objects in unpredictable locations --- a teleoperator system with a computer for manipulator control
N77-29756
Manipulator system performance measurement
N77-29763
Information and control issues of adaptable-programmable assembly systems for manufacturing and teleoperator applications
N77-29780
TELEVISION SYSTEMS
TV requirements for manipulation in space
N77-29757
Interactive handling of TV and range data for remotely controlled systems
N77-29759
TEXTBOOKS
Development and validation of an equation for predicting the comprehensibility of textural material
[AD-A040755] N77-29789
THERMAL COMFORT
Thermal data from helicopters operating in a sub-arctic environment
A77-42140
THERMAL CONDUCTIVITY
Modeling of the thermophysical processes accompanying muscle contraction in humans
A77-44001
THERMOREGULATION
Convective and radiative heat transfer coefficients for the human body
A77-41748
Thermoregulatory responses during competitive marathon running
A77-41819
Engineering models of the human thermoregulatory system - A review
A77-41950
Modeling of the thermophysical processes accompanying muscle contraction in humans
A77-44001
THRESHOLDS (PERCEPTION)
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865
Psychophysical experiments on spatial summation at threshold level of the human peripheral retina
A77-42873
THYROID GLAND
Prolonged weightlessness effect on postflight plasma thyroid hormones
A77-42132
Thyroid cold acclimation influences on norepinephrine metabolism in brown fat
A77-42180
TIME RESPONSE
Temporal studies with flashed gratings - Inferences about human transient and sustained channels
A77-42872
TISSUES (BIOLOGY)
Mucopolysaccharides and collagen in tissues of hypokinetic rats
A77-41071
TOXIC HAZARDS
Inorganic arsenic
[PB-266182/5] N77-29744
Sulfur dioxide
[PB-266160/1] N77-29745
Health effects of occupational lead and arsenic exposure
[PB-266213/8] N77-29746
TOXICITY AND SAFETY HAZARD
Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires - The assessment of the human survival response during aircraft accidents
A77-40945
Toxicological and skin corrosion testing of selected hazardous materials
[PB-264975/4] N77-28725
TOXICOLOGY
Fire injuries and the pathology and neuropathology of single acute exposures to combustion products - Pathology and neuropathology of aircraft fire victims
A77-40942
Interaction between methyl mercury and radiation effects on nervous systems
[PB-265873/0] N77-28728
TRACE CONTAMINANTS
A statistical study of grab sampling in a closed environment
[AD-A036666] N77-28745
TRACKING (POSITION)
A phase plane approach to study the adaptive nature of a human performing a tracking task
[AD-A036223] N77-28747
TRAINING DEVICES
The training of human voluntary torsion: Tonic and dynamic cycloversion
N77-29733
TRAJECTORY CONTROL
Control and stability problems of remote orbital capture
A77-43644
TRANQUILIZERS
Psychopharmacology in aviation and astronautics
A77-41064
TRANSFER FUNCTIONS
Force feedback systems in undersea manipulator applications
N77-29775
TRANSFORMATIONS (MATHEMATICS)
Gray-level transformations for interactive image enhancement.
N77-29758
TREADMILLS
Validity and reliability of pedometers in habitual activity research
A77-40664

U

U.S.S.R.
Organization and operation of civil aviation medicine in the Soviet Union
A77-42144
ULTRASONIC TESTS
Development of high-resolution ultrasonic imaging techniques for detection and clinical assessment of cardiovascular disease
[PB-265728/6] N77-28730
UNDERWATER ENGINEERING
An overview of underwater remotely manned Systems and sub-systems
N77-29773

An underwater work systems package --- remote handling
N77-29774
Force feedback systems in undersea manipulator applications
N77-29775
Control automation in undersea manipulation systems
N77-29776
UNDERWATER VEHICLES
Manipulator development at the Naval Undersea Center
[AD-A038449] N77-29795
USER REQUIREMENTS
A user assessment of servicing at geostationary orbit
N77-29769

V

V/STOL AIRCRAFT
A survey of piloting factors in fixed-wing V/STOL aircraft
[AIAA 77-1147] A77-43177
VACUUM CHAMBERS
Oxygen regulator performance during decompression
[AD-A038415] N77-29793
VEGETATION GROWTH
Microflora associated with beets during their growth in prolonged hydroponic cultivation
A77-41077
Effects of increased gravity force on mutations of sunflower hypocotyls
A77-43016
VENTILATION
Limits on Va/Q distributions from analysis of experimental inert gas elimination --- ventilation-perfusion ratios
A77-41817
Dynamic and steady-state respiratory responses to bicycle exercise
A77-41820
VESTIBULAR TESTS
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man
A77-41072
Function of the otolithic apparatus of cosmonauts following space flight
A77-41082
VESTIBULES
Electron microscope investigations of the effect of five-day weightlessness simulation on the development of the frog embryo (rana temporaria) vestibular organ
[ESA-TT-397] N77-29732
VIBRATION EFFECTS
Human performance and transmissibility under sinusoidal and mixed vertical vibration
A77-41456
The use of an intensity matching technique to evaluate human response to whole-body vibration
A77-41457
The evaluation of discomfort produced by multiple frequency whole-body vibration
A77-41458
VIBRATION TESTS
The use of an intensity matching technique to evaluate human response to whole-body vibration
A77-41457
VIDEO EQUIPMENT
A case study evaluation of a satellite video telemedicine project in rural Alaska
N77-29735
VIKING LANDER SPACECRAFT
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639
VISCOELASTICITY
Artificial softness sensing - an automatic apparatus for measuring viscoelasticity
N77-29781
VISUAL AIDS
The training of human voluntary torsion: Tonic and dynamic cycloversion
N77-29733
VISUAL DISCRIMINATION
Visual capacities of the owl monkey /Aotus trivirgatus/. I - Spectral sensitivity and color vision. II - Spatial contrast sensitivity
A77-42867
Detection and discrimination of simple and complex patterns at low spatial frequencies --- visual waveform perception
A77-42868
VISUAL PERCEPTION
Dividing attention between auditory and visual perception
A77-40693
Study of color vision by the method of recording induced potentials
A77-41152
Is the method for 'perception time' measurement adequate --- optical tracking
A77-41230
Motion sickness - An evolutionary hypothesis
A77-41640
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865
Visual capacities of the owl monkey /Aotus trivirgatus/. I - Spectral sensitivity and color vision. II - Spatial contrast sensitivity
A77-42867
Detection and discrimination of simple and complex patterns at low spatial frequencies --- visual waveform perception
A77-42868
Is perceived length affected by interactions between orientation detectors --- visual illusion from randomly orientated shapes
A77-42869
Temporal studies with flashed gratings - Inferences about human transient and sustained channels
A77-42872
Psychophysical experiments on spatial summation at threshold level of the human peripheral retina
A77-42873
Information processing of dot matrix displays
[AD-A036668] N77-28731
Optical properties and visual effects of face masks
[AD-A038197] N77-28742
VISUAL PIGMENTS
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865
VISUAL STIMULI
Long-lasting afterimages caused by neural adaptation
A77-42871
Temporal studies with flashed gratings - Inferences about human transient and sustained channels
A77-42872
VISUAL TASKS
Dividing attention between auditory and visual perception
A77-40693
Voluntary eye movements and alcohol
A77-42135
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865
Color coding effects on human performance: An annotated bibliography
[AD-A039318] N77-28732
A phase plane approach to study the adaptive nature of a human performing a tracking task
[AD-A036223] N77-28747
Application of tracking tasks in ergonomic studies
[FB-23] N77-29790
VOICE DATA PROCESSING
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784
VULNERABILITY
Designing robots for industrial environments --- economic factors and vulnerability
N77-29778

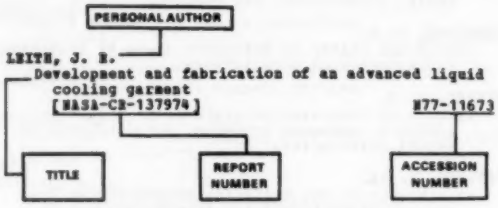
W

WAKEFULNESS
The effect of experimentally-induced generalized convulsions on the cycle of wakefulness and sleep
A77-40881
WALKING MACHINES
Parametric optimization in the problem of biped locomotion
A77-43279

WATER
The development of portable coolers for the liquid conditioned suit
[ARC-CP-1330] N77-28734
WATER QUALITY
Alga growth potential of waste water effluents in Hawaiian receiving waters
[PB-265172/7] N77-28715
WAVEFORMS
Detection and discrimination of simple and complex patterns at low spatial frequencies --- visual waveform perception
A77-42868
WEIGHTLESSNESS
Gravitation and the living organism --- Russian book
A77-41652
Prolonged weightlessness effect on postflight plasma thyroid horsones
A77-42132
WEIGHTLESSNESS SIMULATION
Electron microscope investigations of the effect of five-day weightlessness simulation on the development of the frog embryo (rana temporaria) vestibular organ
[ESA-TT-397] N77-29732
WORK
Circulatory and local muscle response to static mutual work
N77-29736
WORK CAPACITY
Psychopharmacology in aviation and astronautics
A77-41064
WORKLOADS (PSYCHOPHYSIOLOGY)
EEG correlates of the quality of work of an operator during different functional states
A77-41153
A survey of piloting factors in fixed-wing V/STOL aircraft
[AIAA 77-1147] A77-43177

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



The title of the document is used to provide the user with a brief description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

ABIDIN, B. I.
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081

ABRAMOVA, G. M.
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076

ALEXANDER, M.
Effects of encumbering clothing, personal-protective equipment and restraints on body size and arm-reach capability of USAF aircrewmen
[AD-A036682] N77-28746

ALFORD, R. C.
A unit task simulator for the evaluation of interactive man-computer systems
[PB-265097/6] N77-28738

ANCKER, C. J., JR.
Stochastic modelling of remotely manned systems
N77-29752

ANDO, Y.
Effects of noise on sleep of babies
A77-41875

ANKEL, H.
Stabilization studies on human interferon
[PB-264824/4] N77-28724

ANSELMO, V. J.
Effect of evaporative surface cooling on thermographic assessment of burn depth
A77-42239

ANTIPOVA, T. P.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065

APINCHIN, N. I.
Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus
A77-41225

ARMSTRONG, T. J.
Circulatory and local muscle response to static mutual work
N77-29736

ASAYAMA, J.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397

B

BACHRACH, A. J.
Human factors and diving equipment design
[AD-A040110] N77-28749

BAEHR, E. F.
Corneal seal device
[NASA-CASE-LEW-12258-1] N77-28716

BAEVSKII, R. M.
Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects
A77-41151

BAIRD, J.
Restraint systems evaluation program
[PB-265562/9] N77-28740

BALLIET, R.
The training of human voluntary torsion: Tonic and dynamic cycloversion
N77-29733

BARBATO, G. J.
Information processing of dot matrix displays
[AD-A036668] N77-28731

BARKER, E.
Color coding effects on human performance: An annotated bibliography
[AD-A039318] N77-28732

BARLOW, G. F.
The development of portable coolers for the liquid conditioned suit
[ARC-CP-1330] N77-28734

BARNES, D.
Protracted radiation-stressed primate performance
A77-42133

BARON, W. S.
Increment spectral sensitivities of the primate late receptor potential and b-wave
A77-42866

BATENCHUK-TUSKO, T. V.
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067

BEJCZY, A. K.
Effect of hand-based sensors on manipulator control performance
N77-29755

BEKEY, G. A.
The human controller in car following
N77-29753

BELAN, A. S.
Respiratory mechanics during speech in the course of static physical exercise
A77-41074

BELETSKII, V. V.
Parametric optimization in the problem of biped locomotion
A77-43279

BERGOT, G.
Necessary medical and paramedical measures for an airport catastrophe
A77-40949

BERTSCHE, W. R.
Force feedback systems in undersea manipulator applications
N77-29775

BEYERMANN, K.
Identification of 180 million years old, probably unchanged melanine
[NASA-TM-75132] N77-29729

BINKHORST, R. A.
A portable heart rate distribution recorder for studying daily physical activity
A77-40661

BOLLER, H. E.
Linear models for man as controller
[PB-24] N77-29791
BOLTON, C. B.
An anthropometric survey of 2,000 Royal Air Force aircrew, 1970/1971
[ARC-R/M-3772] N77-28722
BONNER, W. A.
On the origin of biological chirality via natural beta-decay
A77-43005
BOUMAN, H. A.
Psychophysical experiments on spatial summation at threshold level of the human peripheral retina
A77-42873
BREITMEYER, B. G.
Temporal studies with flashed gratings - Inferences about human transient and sustained channels
A77-42872
BRESLAV, I. S.
Dynamic control of space cabin environmental parameters
A77-41073
BRIEGLEB, W.
Electron microscope investigations of the effect of five-day weightlessness simulation on the development of the frog embryo (rana temporaria) vestibular organ
[ESA-TT-397] N77-29732
BRIK, H.
Echocardiographic diagnosis of left anterior descending coronary artery disease
A77-40672
BRODAL, P.
Capillary supply of skeletal muscle fibers in untrained and endurance-trained men
A77-42188
BRODIE, S. B.
The assembly of large structures in space
N77-29770
BROWN, A. H.
Effects of increased gravity force on nutations of sunflower hypocotyls
A77-43016
BRYSON, A. L.
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671
BUCK, J. R.
A unit task simulator for the evaluation of interactive man-computer systems
[PB-265097/6] N77-28738
BUGAR, K. P.
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081
BURKETT, J. R.
Development and validation of an equation for predicting the comprehensibility of textural material
[AD-A040755] N77-29789
BURNHAM, G. O.
The human controller in car following
N77-29753

C

CAELLI, T.
Is perceived length affected by interactions between orientation detectors
A77-42869
CALLIS, G. D.
A phase plane approach to study the adaptive nature of a human performing a tracking task
[AD-A036223] N77-28747
CAMPBELL, F. W.
Detection and discrimination of simple and complex patterns at low spatial frequencies
A77-42868
CARSON, B. W.
Health effects of occupational lead and arsenic exposure
[PB-266213/8] N77-29746
CARPENTER, M. B.
Fastigial nucleus and orthostatic reflex in cat and monkey
A77-42186
CEPOLLINA, F. J.
Remote servicing of free-flying spacecraft
N77-29765
CHANEY, R. D.
Accidental hypothermia - An experimental study of practical rewarming methods
A77-42138
CHAPMAN, D. K.
Effects of increased gravity force on nutations of sunflower hypocotyls
A77-43016
CHAVARRI, M.
Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol
A77-42139
CHEKIRDA, A. S.
Functional shifts in parachute jumps by beginning and experienced parachutists
A77-40656
CHERRY, J. P.
Effects of hyperoxia on glutathione reductase activity, membrane proteins, and esterases of rabbit erythrocytes
A77-42141
CHIZHOV, A. IA.
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790
CHUDINOV, P. S.
Parametric optimization in the problem of biped locomotion
A77-43279
COAN, P. P.
TV requirements for manipulation in space
N77-29757
COHEN, H.
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865
COHEN, H. H.
Human performance and transmissibility under sinusoidal and mixed vertical vibration
A77-41456
COLLEN, D.
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man
A77-41816
COLLINS, W. E.
Some psychological correlates of motion sickness susceptibility
A77-42131
COLLIS, M. L.
Accidental hypothermia - An experimental study of practical rewarming methods
A77-42138
COURCHESNE, E.
Event-related brain potentials - Comparison between children and adults
A77-42444
COX, J. W., JR.
Left precordial isopotential mapping during supine exercise
A77-42394
CRAIG, S. J.
A survey of piloting factors in fixed-wing V/STOL aircraft
[AIAA 77-1147] A77-43177
CROOKS, W. H.
TV requirements for manipulation in space
N77-29757
CROSSLEY, F. R. E.
Design for a three-fingered hand
A77-43647
Design for a three-fingered hand
N77-29761

D

DAVIS, H.
Arousal from sleep - The physiological and subjective effects of a 15 dB/A/ reduction in aircraft flyover noise
A77-42134
DAY, D.
Interaction between methyl mercury and radiation effects on nervous systems
[PB-265873/0] N77-28728

DEGTIAREV, V. A.
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067
DELECH, P.
The peacetime evaluation of the pilot skill factor in air-to-air combat
[AD-A039880] N77-29792
DEROCHER, M. L., JR.
Orbital servicing, and remotely manned systems
N77-29767
DIDION, J.
Restraint systems evaluation program
[PB-265562/9] N77-28740
DONGES, E.
Linear models for man as controller
[PB-24] N77-29791
DONOVAN, S. S.
Screening study to identify phase change coolants for portable life support systems
[AD-A038504] N77-28737
DOROSHEV, V. G.
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067
DOUGLAS, A. M.
K-42 exchange during myocardial ischemia
A77-42183
DOWDIE, R. F.
Left precordial isopotential mapping during supine exercise
A77-42394
DRISCOLL, T. B.
Prolonged weightlessness effect on postflight plasma thyroid hormones
A77-42132
DRUGOVA, M. A.
Microflora associated with beets during their growth in prolonged hydroponic cultivation
A77-41077
DUBININ, N. P.
Gravitation and the living organism
A77-41652
DUDETSKII, V. I.
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070

E

EGOROV, M. A.
Photo- and stereographic methods for studying the disk of the optic nerve
A77-40655
EINHORN, I. N.
Cabin materials, their combustion properties and the nature of noxious and toxic gases in fires - The assessment of the human survival response during aircraft accidents
A77-40945
ELSNER, R.
Effects of growth, diving history, and high altitude on blood oxygen capacity in harbor seals
A77-41815
ENDO, M.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397
ERICH, U.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731
Definition study for Spacelab experiments in the field of basic medicine and process engineering
[ESA-TT-391] N77-29740
ESTABROOK, M. B.
An underwater work systems package
N77-29774
EVANS, J. M.
An analysis of the contribution of small airways to lower airway resistance
N77-28720
EVANS, J. W.
Limits on Va/Q distributions from analysis of experimental inert gas elimination
A77-41817
EVANS, T. C., JR.
Development of high-resolution ultrasonic imaging techniques for detection and clinical assessment of cardiovascular disease
[PB-265728/6] N77-28730

F

FAITELBERG-BLANK, V. R.
The effect of decimeter waves on central cerebral structures
A77-40882
FAUGERAS, O. D.
Digital color image processing and psychophysics within the framework of a human visual model
[AD-A039007] N77-29742
FISHBURNE, B. P., JR.
E-2 C systems approach to training. Phase 1
[AD-A036264] N77-28748
FISK, C. S.
The dynamic function of selected muscles of the forearm: An electromyographical and cinematographical analysis
N77-28718
FITTES, B. A.
Gray-level transformations for interactive image enhancement.
N77-29758
FIUL, A.
On-orbit serviceable satellite design
N77-29766
FLAHR, M. D.
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671
FOOTE, D. R.
A case study evaluation of a satellite video telemedicine project in rural Alaska
N77-29735
FORDON, W. A.
Computer-aided differential diagnosis of hypertension
N77-29737
FORTUIN, N. J.
Echocardiographic assessment of a normal adult aging population
A77-42396
FOSTER, J. R.
Interaction of aortic pressure and left ventricular end-diastolic pressure in the dog
A77-42187
FOTHERGILL, L. C.
The use of an intensity matching technique to evaluate human response to whole-body vibration
A77-41457
The evaluation of discomfort produced by multiple frequency whole-body vibration
A77-41458
FREDERIKSEN, J.
Echocardiographic assessment of a normal adult aging population
A77-42396
FREEDMAN, L. A.
TV requirements for manipulation in space
N77-29757
FREEDY, A.
Control automation in undersea manipulation systems
N77-29776
System integration of pattern recognition, adaptive aided, upper limb prostheses
N77-29782
FREUND, H.
Carbohydrate and fat metabolism of unacclimatized men during and after submaximal exercise in cool and hot environments
A77-40662
FROELICHER, V. F., JR.
Review of epidemiology in clinical cardiology
A77-42183
FROHLICH, E. D.
Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade
A77-42185

FROST, J. D., JR.
Snap-in compressible biomedical electrode
[NASA-CASE-MSC-14623-1] N77-28717
FURCHNER, C. S.
Detection and discrimination of simple and complex patterns at low spatial frequencies
A77-42868
FURUKAWA, K.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397

G

GANGULY, A.
Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol
A77-42139
GANZ, L.
Temporal studies with flashed gratings - Inferences about human transient and sustained channels
A77-42872
GARG, A.
A metabolic rate prediction model for manual materials handling jobs
N77-29749
GASAWAY, D. C.
Evaluation of V-51 and EAR (trademark) earplugs for use in flight
[AD-A038414] N77-28741
GASSENMAIER, T.
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension
A77-42993
GAZENKO, O. G.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065
GERASIMOVA, G. K.
The electrolyte content in the blood of animals and transport of potassium-ion erythrocytes under a constant magnetic field
A77-41075
GERSTENBLITH, G.
Echocardiographic assessment of a normal adult aging population
A77-42396
GIGINEISHVILI, G. M.
Method of photoelectric nystagmography
A77-40738
GINSBURG, E. V.
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076
GLOD, G. D.
Psychopharmacology in aviation and astronautics
A77-41064
GOLUB, D. M.
Formation of additional nerve connections of the common carotid artery
A77-41224
GONZALEZ, R. C.
Gray-level transformations for interactive image enhancement.
N77-29758
GORDON, G. D.
A user assessment of servicing at geostationary orbit
N77-29769
GORIACHEVA, L. L.
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070
GORLIN, R.
Echocardiographic diagnosis of left anterior descending coronary artery disease
A77-40672
GREEN, P. S.
Development of high-resolution ultrasonic imaging techniques for detection and clinical assessment of cardiovascular disease
[PB-265728/6] N77-28730
GREENLEAF, J. F.
Development of high-resolution ultrasonic imaging techniques for detection and clinical assessment of cardiovascular disease
[PB-265728/6] N77-28730
GREGORY, T. J.
Remotely piloted aircraft in the civil environment
N77-29772
GREIFF, D.
Stabilization studies on human interferon
[PB-264824/4] N77-28724
GRIEPAHN, H.
Determination of pulse rate variations caused by a stimulus
A77-40660
GRIFFIN, M. J.
The use of an intensity matching technique to evaluate human response to whole-body vibration
A77-41457
The evaluation of discomfort produced by multiple frequency whole-body vibration
A77-41458
GRIFFITH, J. M.
Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries
A77-42395
GRIGOREVA, L. P.
Study of color vision by the method of recording induced potentials
A77-41152
GRIGORIAN, A. S.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065
GROFF, S. D.
Development and validation of an equation for predicting the comprehensibility of textural material
[AD-A040755] N77-29789
GROSSBERG, S. M.
Stabilization studies on human interferon
[PB-264824/4] N77-28724
GRUENEWALD, K.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731
GRUNNET, M. L.
Fire injuries and the pathology and neuropathology of single acute exposures to combustion products - Pathology and neuropathology of aircraft fire victims
A77-40942
GUSKOVA, A. K.
Features of the cerebral and peripheral blood circulation in healthy people of different ages
A77-41154

H

HACKNEY, J. D.
Effects of atmospheric pollutants on human physiologic function
[PB-265846/6] N77-28729
HALL, R. R.
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671
HALLICK, T. M.
Technology advancement of the electrochemical CO2 concentrating process
[NASA-CR-151995] N77-28736
HAMMOND, H. P.
Thyroid cold acclimation influences on norepinephrine metabolism in brown fat
A77-42180
HAMOLSKY, M. W.
Thyroid cold acclimation influences on norepinephrine metabolism in brown fat
A77-42180

HANDCASTLE, J.
Interaction between methyl mercury and radiation effects on nervous systems
[PB-265873/0] N77-28728
HANDZINSKI, E.
A psychophysical analysis of complex integrated displays
[AD-A039260] N77-28727
HARTON, E. E., JR.
Toxicological and skin corrosion testing of selected hazardous materials
[PB-264975/4] N77-28725
HARTZELL, E. J.
A phase plane approach to study the adaptive nature of a human performing a tracking task
[AD-A036223] N77-28747
HASENBAIER, D.
Identification of 180 million years old, probably unchanged melanine
[NASA-TM-75132] N77-29729
HATTORI, E.
Effects of noise on sleep of babies
A77-41875
HEER, E.
Robots and manipulator systems; Proceedings of the Second Conference on Remotely Manned Systems, Los Angeles, Calif., June 9-11, 1975
A77-43641
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784
HENKEL, E.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731
HENRY, W. L.
Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries
A77-42395
HEPP, W.
Definition study for Spacelab experiments in the field of basic medicine and process engineering
[ESA-TT-391] N77-29740
HEPPNER, D. B.
Technology advancement of the electrochemical CO2 concentrating process
[NASA-CR-151995] N77-28736
HERMAN, M. V.
Echocardiographic diagnosis of left anterior descending coronary artery disease
A77-40672
HERMANSEN, L.
Capillary supply of skeletal muscle fibers in untrained and endurance-trained men
A77-42188
HIGENBOTTAM, C.
Thermal data from helicopters operating in a sub-arctic environment
A77-42140
HILLMAN, C. E., JR.
Snap-in compressible biomedical electrode
[NASA-CASE-MSC-14623-1] N77-28717
HINES, J.
Interaction between methyl mercury and radiation effects on nervous systems
[PB-265873/0] N77-28728
HINTON, W. E., JR.
E-2 C systems approach to training. Phase 1
[AD-A036264] N77-28748
HIOTT, E. F.
Oxygen regulator performance during decompression
[AD-A038415] N77-29793
HOBBS, P. C.
An anthropometric survey of 500 Royal Air Force aircrew heads, 1972
[ARC-R/M-3773] N77-28723
HOBO, T.
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639
HOEFT, G.
Voluntary eye movements and alcohol
A77-42135
HOEPSTEIN, U.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731
HOLDEN, E. D.
Oxygen regulator performance during decompression
[AD-A038415] N77-29793
HOLLOMAN, G. H., JR.
Computer-based system for analysis of respiratory responses to exercise
A77-41821
HOOD, D. C.
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865
HOOD, W. B., JR.
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184
HORNUNG, R. W.
Human performance and transmissibility under sinusoidal and mixed vertical vibration
A77-41456
HORVATH, S. M.
Thermoregulatory responses during competitive marathon running
A77-41819
Sleep at altitude
A77-42136
Cardiac output during sleep at altitude
A77-42137
HRISTIC, D.
New control concept of anthropomorphic manipulators
N77-29787
HUANG, T. F.
Fastigial nucleus and orthostatic reflex in cat and monkey
A77-42186
HUGHES, R.
Restraint systems evaluation program
[PB-265562/9] N77-28740
HUPP, E. W.
Interaction between methyl mercury and radiation effects on nervous systems
[PB-265873/0] N77-28728
HUSTON, J. C.
Numerical prediction of head/neck response to shock-impact
A77-42567
HUSTON, R. L.
Numerical prediction of head/neck response to shock-impact
A77-42567
HUTCHEON, E. A.
Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man
A77-41818
HWANG, C.-L.
Engineering models of the human thermoregulatory system - A review
A77-41950
HYATT, R. E.
Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man
A77-41818

I

IADRINTSEV, V. A.
Features of the cerebral and peripheral blood circulation in healthy people of different ages
A77-41154
IAROSHEVICH, S. A.
Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus
A77-41225
IARULLIN, KH. KH.
Characterization of regional circulation and vasomotor regulation after a two-month space flight
A77-41066

ICHIHARU, K.
Artificial softness sensing - an automatic apparatus for measuring viscoelasticity
N77-29781

IDEKER, R. E.
Left precordial isopotential mapping during supine exercise
A77-42394

IJICHI, H.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397

INGJER, F.
Assessment of maximal aerobic power in specifically trained athletes
A77-41814
Capillary supply of skeletal muscle fibers in untrained and endurance-trained men
A77-42188

IRONDELLE, H.
Carbohydrate and fat metabolism of unacclimatized men during and after submaximal exercise in cool and hot environments
A77-40662

ISHCHENKO, V. P.
Features of the cerebral and peripheral blood circulation in healthy people of different ages
A77-41154

ITO, T.
Neural control of glycogen content and its diurnal rhythm in mouse pineal cell
A77-42181

IUNUSOVA, L. S.
Microflora associated with beets during their growth in prolonged hydroponic cultivation
A77-41077

IVANOV, A. A.
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078

J

JACOB, H.
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension
A77-42993

JACOBS, G. H.
Visual capacities of the owl monkey /Aotus trivirgatus/. I - Spectral sensitivity and color vision. II - Spatial contrast sensitivity
A77-42867

JACOBSEN, S. C.
Application of a postulate based control theory for an artificial arm
N77-29783

JANGER, R.
Protracted radiation-stressed primate performance
A77-42133

JAMES, R. H.
Technology for the development of a portable metabolic monitor
[PB-266215/3]
N77-29743

JANSSON, P.
Stabilization studies on human interferon
[PB-264824/4]
N77-28724

JANICKI, J. S.
Ejection pressure and the diastolic left ventricular pressure-volume relation
A77-42182

JERARD, R. B.
Application of a postulate based control theory for an artificial arm
N77-29783

JOFFE, C. D.
Echocardiographic diagnosis of left anterior descending coronary artery disease
A77-40672

JOHANSSEN, G.
Linear models for man as controller
[PB-24]
N77-29791

JOHNSON, P. C.
Prolonged weightlessness effect on postflight plasma thyroid hormones
A77-42132

JOHNSON, S. L.
E-2 C systems approach to training. Phase 1
[AD-A036264]
N77-28748

JOHNSTON, A. R.
Proximity sensor technology for manipulator end effectors
A77-43648
Proximity sensor technology for manipulator end effectors
N77-29760

K

KACHI, T.
Neural control of glycogen content and its diurnal rhythm in mouse pineal cell
A77-42181

KALINICHENKO, V. V.
Changes in the orthostatic stability of cosmonauts after space flights of 2 to 63 days' duration
A77-41068

KAPLAN, H. H.
Control and stability problems of remote orbital capture
A77-43644
Control and stability problems of remote orbital capture
N77-29771

KARAKOZOV, K. G.
Method of photoelectric nystagmography
A77-40738

KARCHAK, A., JR.
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784

KARNARKAR, J.
Remotely piloted aircraft in the civil environment
N77-29772

KATO, I.
Artificial softness sensing - an automatic apparatus for measuring viscoelasticity
N77-29781

KATSUHE, H.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397

KATTUS, A. A.
Exercise testing in the diagnosis of coronary heart disease - A perspective
A77-43723

KAVKASIDZE, M. G.
The effect of experimentally-induced generalized convulsions on the cycle of wakefulness and sleep
A77-40881

KELLER, F. W., JR.
Left precordial isopotential mapping during supine exercise
A77-42394

KEMPER, H. C. G.
Validity and reliability of pedometers in habitual activity research
A77-40664

KENNEDY, D. H.
Thyroid cold acclimation influences on norepinephrine metabolism in brown fat
A77-42180

KENWARD, M.
An anthropometric survey of 2,000 Royal Air Force aircrew, 1970/1971
[ARC-R/M-3772]
N77-28722

KERSTEN, L.
The LEMMA concept - A new manipulator
A77-43646
The LEMMA concept: A new manipulator
N77-29762

KERSTING, D.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1]
N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2]
N77-29731

KHAKIMOV, P. A.
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416

KHARITONOV, V. V.
Features of the cerebral and peripheral blood circulation in healthy people of different ages
A77-41154

KHROMYKH, IU. N.
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795

KHUDIAKOVA, N. A.
The blood coagulation system during a 12-day immersion in water and the prophylactic role of rotation in a centrifuge
A77-41079

KIKUCHI, R.
Inefficiency of sanitation measures aboard commercial aircraft - Environmental pollution and disease
A77-42142

KING, G. A. M.
Symbiosis and the origin of life
A77-43008

KING, T. L.
A statistical study of grab sampling in a closed environment
[AD-A036666] N77-28745

KIRILLOVA, Z. A.
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067

KIRKPATRICK, M.
Manipulator system performance measurement
N77-29763

KISSLING, G.
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension
A77-42993

KODAMA, A. M.
Effects of growth, diving history, and high altitude on blood oxygen capacity in harbor seals
A77-41815

KOLESNIK, A. G.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065

KONISSAROVA, N. A.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065

KONKOVA, O. V.
Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts
A77-41069

KONSTANTINOV, M. S.
Inertia forces in robots and manipulators
N77-29764

KONZ, S. A.
Engineering models of the human thermoregulatory system - A review
A77-41950

KORIDZE, M. G.
The effect of experimentally-induced generalized convulsions on the cycle of wakefulness and sleep
A77-40881

KOSICHENKO, L. P.
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790

KOTLER, M. M.
Pitfalls and limitations of M-mode echocardiography
A77-44175

KOZHABEKOV, A. K.
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416

KREBS, M. J.
Color coding effects on human performance: An annotated bibliography
[AD-A039318] N77-28732

KRIVOSHEI, P. A.
Modeling of the thermophysical processes accompanying muscle contraction in humans
A77-44001

KUDO, Y.
Artificial softness sensing - an automatic apparatus for measuring viscoelasticity
N77-29781

KUNISHIGE, M.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397

KUSTOV, V. V.
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081

KUZIN, A. M.
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790

L

LAKATTA, E. G.
Echocardiographic assessment of a normal adult aging population
A77-42396

LAPSHINA, N. A.
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067

LAUBACH, L. L.
Effects of encumbering clothing, personal-protective equipment and restraints on body size and arm-reach capability of USAF aircrewmen
[AD-A036682] N77-28746

LAURINEN, P.
Long-lasting afterimages caused by neural adaptation
A77-42871

LEACH, C. S.
Prolonged weightlessness effect on postflight plasma thyroid hormones
A77-42132

LEHMERZ, A. M.
Evaluation and interpretation of the EKG /2nd revised edition/
A77-43876

LENTZ, J. M.
Some psychological correlates of motion sickness susceptibility
A77-42131

LERIQUIER, Y.
Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats
A77-42405

LEVERE, T. E.
Arousal from sleep - The physiological and subjective effects of a 15 dB/A/ reduction in aircraft flyover noise
A77-42134

LEVETT, J.
Voluntary eye movements and alcohol
A77-42135

LIPPNER, G.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731

LOEPPKY, J. A.
Total body water and lean body mass estimated by ethanol dilution
A77-41813

LOMOVTSEV, E. V.
The combined effect of ultrashort-wave irradiation and hyperoxia on animals
A77-40657

LONDON, G. M.
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients
A77-42413

LUETSCHER, J. A.
Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol
A77-42139

LUFT, U. C.
Total body water and lean body mass estimated by ethanol dilution
A77-41813

LUTSENKO, N. N.
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070

LYMAN, J.
System integration of pattern recognition, adaptive aided, upper limb prostheses
N77-29782

M

MACK, T.
New trends in phonocardiograph modulators
A77-43325

MAFFIOLO, G.
Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats
A77-42405

MALONE, T. B.
Manipulator system performance measurement
N77-29763

MALSKY, P. N.
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184

MANAROV, T. N.
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416

MANCEL, G.
Studies of the effects of NO, NO2, and SO2 and of their combined effects on rats
A77-42405

MANSFIELD, J. N.
Remote servicing of free-flying spacecraft
N77-29765

MARCUS, P.
Thermal data from helicopters operating in a sub-arctic environment
A77-42140

MARON, B. J.
Cross-sectional echocardiography in the diagnosis of congenital heart disease - Identification of the relation of the ventricles and great arteries
A77-42395

MARON, M. B.
Thermoregulatory responses during competitive marathon running
A77-41819

MARTIN, M. D.
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671

MARTIN, W.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731

MASSARO, D. W.
Dividing attention between auditory and visual perception
A77-40693

MATEEV, S.
Is the method for 'perception time' measurement adequate
A77-41230

MATSUKUBO, H.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397

MATSUURA, T.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397

MAZHUL, L. N.
Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus
A77-41225

MCCONVILLE, J. T.
Effects of encumbering clothing, personal-protective equipment and restraints on body size and arm-reach capability of USAF aircrewmen
[AD-A036682] N77-28746

MCFARLAND, S. N.
Lunar rover vehicle - an implication for rehabilitation
N77-29786

MCGOVERN, D. E.
An investigation of supervisory control of remote manipulation
A77-43642
An investigation of supervisory control of remote manipulation
N77-29754

MCGOWAN, R. L.
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671

MCNEIL, R. J.
Mass spectroscopic analysis of polyether and polyurethane foam plastics degeneration in the SPH-4 helmet
[AD-A036447] N77-28744

MEEN, H. D.
Assessment of maximal aerobic power in specifically trained athletes
A77-41814

MEISTER, D.
Assessment of a prototype human resources data handbook for systems engineering
[AD-A039269] N77-28726

MGALOBLISHVILI, N. N.
The effect of experimentally-induced generalized convulsions on the cycle of wakefulness and sleep
A77-40881

MIASNIKOV, A. P.
The combined effect of ultrashort-wave irradiation and hyperoxia on animals
A77-40657

MIASNIKOV, V. I.
Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts
A77-41069

MILHORN, H. T., JR.
Dynamic and steady-state respiratory responses to bicycle exercise
A77-41820
Computer-based system for analysis of respiratory responses to exercise
A77-41821

MILLER, E. N.
Alga growth potential of waste water effluents in Hawaiian receiving waters
[PB-265172/7] N77-28715

MILLER, J. C.
Sleep at altitude
A77-42136
Cardiac output during sleep at altitude
A77-42137

MILLIEZ, P. L.
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients
A77-42413

MILLS, R. G.
System modeling and simulation: Application of a research methodology and test
N77-28733

MINNICH, J.
Interaction between methyl mercury and radiation effects on nervous systems
[PB-265873/0] N77-28728

MINTZ, G.
Pitfalls and limitations of M-mode echocardiography
A77-44175

MIROLIUBOV, A. V.
EEG correlates of the quality of work of an operator during different functional states
A77-41153

MIRVIS, D. M.
Left precordial iscpotential mapping during supine exercise
A77-42394
MITCHELL, J. P.
E-2 C systems approach to training. Phase 1 [AD-A036264] N77-28748
MOCHIDA, T.
Convective and radiative heat transfer coefficients for the human body
A77-41748
MOGILNAIA, G. M.
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070
MOHLER, S. R.
Organization and operation of civil aviation medicine in the Soviet Union
A77-42144
MORRIS, A. P.
Effects of fatiguing isometric and isotonic exercise on resisted and unresisted reaction time components
A77-40659
MOZZHUKHIN, A. S.
Functional shifts in parachute jumps by beginning and experienced parachutists
A77-40656
MULLER, J. E.
Diagnosis of myocardial infarction - Historical notes from the Soviet Union and the United States
A77-43725
MURRAY, P. A.
The role of potassium in the control of the coronary circulation: Mechanism of action and time course
N77-28719
MYHRE, L. G.
Total body water and lean body mass estimated by ethanol dilution
A77-41813

N

NADKARNI, A. A.
Control and stability problems of remote orbital capture
A77-43644
Control and stability problems of remote orbital capture
N77-29771
NAKATSUKA, I. K.
Alga growth potential of waste water effluents in Hawaiian receiving waters [PB-265172/7] N77-28715
NAKHILNITSKAIA, Z. N.
The electrolyte content in the blood of animals and transport of potassium-ion erythrocytes under a constant magnetic field
A77-41075
NAVARATIKIAN, M. A.
The effect of some catecholamines on pulmonary circulation
A77-40883
NEDVETSKAIA, G. D.
Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus
A77-41225
NELNS, W. P.
Remotely piloted aircraft in the civil environment
N77-29772
NEUBERT, J.
Electron microscope investigations of the effect of five-day weightlessness simulation on the development of the frog embryo (rana temporaria) vestibular organ [ESA-TT-397] N77-29732
NEUMANN, G.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report [ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings [ESA-CR(P)-943-VOL-2] N77-29731
NEVINS, J. L.
Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications
A77-43643
Information and control issues of adaptable-programmable assembly systems for manufacturing and teleoperator applications
N77-29780
NEVSKAIA, G. P.
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076
NIKULINA, G. A.
Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects
A77-41151
NILSSON, L.
Impact loads produced by human motion. Part 1: background and experimental investigation [PB-264950/7] N77-28739
NORTH, R. A.
Task components and demands as factors in dual-task performance [AD-A038634] N77-29748
NOVIKOV, I. I.
Formation of additional nerve connections of the common carotid artery
A77-41224
NOYES, H. P.
On the origin of biological chirality via natural beta-decay
A77-43005

O

OPLETAL, Z.
New trends in phonocardiograph modulators
A77-43325
OTROSHCHENKO, V. A.
The role of mineral surfaces in the origin of life
A77-43006

P

PACE, N.
Effects of growth, diving history, and high altitude on blood oxygen capacity in harbor seals
A77-41815
PACHELLA, R. G.
Intellectual performance under stress [AD-A038196] N77-28743
PAESLACK, V.
Design and control of a manipulator for tetraplegics
N77-29785
PAKHOMOV, G. N.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065
PAL, R.
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639
PANIKAROVSKII, V. V.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065
PARK, W. T.
Location and acquisition of objects in unpredictable locations
N77-29756
PARRY, W. E.
Pitfalls and limitations of M-mode echocardiography
A77-44175
PASSERELLO, C. E.
Numerical prediction of head/neck response to shock-impact
A77-42567
PATRICK, R.
Protracted radiation-stressed primate performance
A77-42133

PAUL, S. J.
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184
PEARCE, D. H.
Dynamic and steady-state respiratory responses to bicycle exercise
A77-41820
Computer-based system for analysis of respiratory responses to exercise
A77-41821
PEREVALOV, G. M.
The effect of decimeter waves on central cerebral structures
A77-40882
PESCH, A. J.
Force feedback systems in undersea manipulator applications
N77-29775
PETERS, G. L.
Information processing of dot matrix displays
[AD-A036668] N77-28731
PETRENKO, B. E.
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man
A77-41072
PETTYJOHN, F. S.
Mass spectroscopic analysis of polyether and polyurethane foam plastics degeneration in the SPH-4 helmet
[AD-A036447] N77-28744
PFEFFER, J. M.
Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade
A77-42185
PFEFFER, M. A.
Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade
A77-42185
PICKETT, M.
Psychological issues in manned spaceflight
A77-41787
PIOCH, E.
Application of tracking tasks in ergonomic studies
[FB-23] N77-29790
PITTERMANN, P.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731
PODDUBNAIA, L. T.
The effect of gamma-radiation on the ammonia excretion of white mice
A77-41081
POLIAKOV, B. I.
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man
A77-41072
POLOSATOV, M. V.
Antibodies to the entire synthetic gastrin molecule in the blood of healthy humans
A77-40884
POMANAREV, S. I.
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067
POMNAMPERUMA, C.
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639
PONOMARENKO, V. A.
Psychological aspects of spatial orientation problems in pilots
A77-40658
PORTUGALOV, V. V.
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078
POTAPOV, P. P.
Mucopolysaccharides and collagen in tissues of hypokinetic rats
A77-41071
POWELL, W. J., JR.
Interaction of aortic pressure and left ventricular end-diastolic pressure in the dog
A77-42187
POWERS, E. R.
Interaction of aortic pressure and left ventricular end-diastolic pressure in the dog
A77-42187
PRIMEAUX, G. R.
Lunar rover vehicle - an implication for rehabilitation
N77-29786
PROKHONCHUKOV, A. A.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065

R

RACHELLA, E. G.
A psychophysical analysis of complex integrated displays
[AD-A039260] N77-28727
RAGOZIN, V. M.
Circulation studies during LBNP aboard the orbital station Salyut-4
A77-41067
RAPPAPORT, B. Z.
The effect of the acoustic reflex on the perception of speech in noise
N77-29734
RAWL, R. R.
Toxicological and skin corrosion testing of selected hazardous materials
[PB-264975/4] N77-28725
RAY, L. E.
Effects of hyperoxia on glutathione reductase activity, membrane proteins, and esterases of rabbit erythrocytes
A77-42141
RAZUMOV, S. A.
Functional shifts in parachute jumps by beginning and experienced parachutists
A77-40656
RECHNITZER, A., B.
An overview of underwater remotely manned Systems and sub-systems
N77-29773
REHEZOV, S. M.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065
REPPERGER, D. W.
A phase plane approach to study the adaptive nature of a human performing a tracking task
[AD-A036223] N77-28747
REYNOLDS, W. J.
Computer-based system for analysis of respiratory responses to exercise
A77-41821
RICCHIUTI, N.
K-42 exchange during myocardial ischemia
A77-42183
RINGLAND, R. F.
A survey of piloting factors in fixed-wing V/STOL aircraft
[AIAA 77-1147] A77-43177
ROBBINS, S. L.
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184
RODARTE, J. R.
Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man
A77-41818
ROESLER, H.
Design and control of a manipulator for tetraplegics
N77-29785
ROMIN, M. IA.
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790
ROSEN, C. A.
Topics in programmable automation
N77-29779

RUNGE, F. C.
Space tug spacecraft/module exchanger (on-orbit servicer)
N77-29768

S

SAFAR, M. E.
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients
A77-42413

SALAZKIN, V. N.
Dynamic control of space cabin environmental parameters
A77-41073

SARIS, W. H. M.
A portable heart rate distribution recorder for studying daily physical activity
A77-40661

SAVVIN, A. B.
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man
A77-41072

SCHATZ, A.
Electron microscope investigations of the effect of five-day weightlessness simulation on the development of the frog embryo (rana temporaria) vestibular organ
[ESA-TT-397] N77-29732

SCHICK, F. V.
On the practical utility of critical flicker fusion frequency measurements to the assessment of mental workload
[ESA-TT-398] N77-29747

SCHMIDT, E. E.
Evaluation and interpretation of the EKG /2nd revised edition/
A77-43876

SCHNEIDER, B.
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865

SCHNEIDER, J.
A model for a non-chemical form of life - Crystalline physiology
A77-43007

SCHOLTES, A. M. W.
Psychophysical experiments on spatial summation at threshold level of the human peripheral retina
A77-42873

SCHRAFT, R. D.
Industrial robots in Europe - market, applications and developments
N77-29777

SCHUBERT, F. H.
Technology advancement of the electrochemical CO2 concentrating process
[NASA-CR-151995] N77-28736

SEDMAK, J. J.
Stabilization studies on human interferon
[PB-264824/4] N77-28724

SEGAL, B. L.
Pitfalls and limitations of M-mode echocardiography
A77-44175

SEMENOVA, T. D.
Study of the diurnal periodic characteristics of the physiological functions for evaluating the state of the regulatory systems of organisms during extreme effects
A77-41151

SEMERARO, N.
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man
A77-41816

SHELDON, G. F.
The role of inorganic phosphate in oxygen transport
[AD-A038769] N77-29741

SHERIDAN, T. B.
Current theories of man-machine systems
N77-29751

SHIELDS, N. L., JR.
Manipulator system performance measurement
N77-29763

SHIMOYAMA, A.
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639

SHINE, K. I.
K-42 exchange during myocardial ischemia
A77-42183

SHUBICH, M. G.
A histochemical study of the digestive organs of mice following flight aboard Cosmos-605
A77-41070

SHULZHENKO, E. B.
The blood coagulation system during a 12-day immersion in water and the prophylactic role of rotation in a centrifuge
A77-41079

SHUTOVA, I. A.
Study of the effect of an UHF electromagnetic field on the blood cells of animals in ontogenesis
A77-41416

SHVETS, V. N.
Heterophilic antibodies and supplementary activity of the blood serum in mice following flight aboard Cosmos-605
A77-41078

SIDOROV, O. IU.
Defensive reactions of the organism when breathing elevated CO2 concentrations
A77-41080

SIEGEL, A. I.
Development and validation of an equation for predicting the comprehensibility of textural material
[AD-A040755] N77-29789

SILVON, Z. K.
Synthetic approach to evaluation of physiological, prepathological, and pathological states of the circulatory apparatus
A77-41225

SIMON, A. CH.
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients
A77-42413

SIMON, C. W.
Analysis of human factors engineering experiments: Characteristics, results, and applications
[AD-A038184] N77-29794

SIMPSON, H. E.
An anthropometric survey of 2,000 Royal Air Force aircrew, 1970/1971
[ARC-R/M-3772] N77-28722

Specimen size-rolls for aircrew headgear based on an analysis of the head measurements of 2000 Royal Air Force aircrew
[ARC-R/M-3774] N77-28735

SKORIK, A. S.
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076

SMITH, D. E.
A statistical study of grab sampling in a closed environment
[AD-A036666] N77-28745

SMITH, G. W.
Orbital servicing, and remotely manned systems
N77-29767

The assembly of large structures in space
N77-29770

SNEL, P.
A portable heart rate distribution recorder for studying daily physical activity
A77-40661

SOLODOVNIK, F. A.
Function of the otolithic apparatus of cosmonauts following space flight
A77-41082

SOLOMONOW, M.
System integration of pattern recognition, adaptive aided, upper limb prostheses
N77-29782

STAMPFER, M.
Behavioral threshold and rhodopsin content as a function of vitamin A deprivation in the rat
A77-42865

STEIN, W.
Application of tracking tasks in ergonomic studies
[FB-23] N77-29790

Linear models for man as controller
[FB-24] N77-29791

STEINMAN, A. M.
Accidental hypothermia - An experimental study of practical rewarming methods
A77-42138

STODDARD, J.
Restraint systems evaluation program
[PB-265562/9] N77-28740

STOKIC, D.
New control concept of anthropomorphic manipulators
N77-29787

STORK, H. L.
Evaluation of V-51 and EAR (trademark) earplugs for use in flight
[AD-A038414] N77-28741

STRAUSS, H. W.
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671

STRAZHEVSKAIA, M. B.
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790

STRELKOV, M. M.
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790

STROESE, S. B.
Assessment of maximal aerobic power in specifically trained athletes
A77-41814

STRUCHKOV, V. A.
Possibility of the radiation protection of the genetic apparatus of the animals and man by means of a gaseous hypoxic mixture /GGS-10/ at low doses of radiation
A77-40790

SUBLETT, F.
Restraint systems evaluation program
[PB-265562/9] N77-28740

SUGARMAN, R. C.
E-2 C systems approach to training. Phase 1
[AD-A036264] N77-28748

SULINO-SANUILLO, E. K.
Defensive reactions of the organism when breathing elevated CO2 concentrations
A77-41080

SUMMERS, W. C.
A phase plane approach to study the adaptive nature of a human performing a tracking task
[AD-A036223] N77-28747

SWORD, A. J.
Location and acquisition of objects in unpredictable locations
N77-29756

SZABODIS, I.
Exercise effects on the time of reactions to auditory stimuli
A77-40663

T

TABEO, A. M.
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man
A77-41072

TAZETDINOV, I. G.
Cardiovascular reaction during orthostatic tests and resistance to vestibular stimuli in man
A77-41072

TEICHOLZ, L. E.
Echocardiographic diagnosis of left anterior descending coronary artery disease
A77-40672

THOMAS, J. P.
Detection and discrimination of simple and complex patterns at low spatial frequencies
A77-42868

TIGRANIAN, R. A.
The microscopic and crystalline structure, microhardness, and mineral saturation of the bony tissue in man after prolonged space flight
A77-41065

TIKHONOV, M. A.
Respiratory mechanics during speech in the course of static physical exercise
A77-41074

TOBLIN, J. A.
On the origin of biological chirality via natural beta-decay
A77-43005

TREISMAN, M.
Motion sickness - An evolutionary hypothesis
A77-41640

TRICOT, J. P.
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man
A77-41816

TSHMUKHAMETOVA, D. M.
Hemopoiesis in dogs whose bone marrow was shielded during administration of proton irradiation in lethal doses
A77-41076

TSYBENKO, V. A.
The effect of some catecholamines on pulmonary circulation
A77-40883

TURNER, G. M.
An anthropometric survey of 2,000 Royal Air Force aircrew, 1970/1971
[ARC-R/M-3772] N77-28722

U

UHRICH, M. W.
Manipulator development at the Naval Undersea Center
[AD-A038449] N77-29795

UHHOLTZ, F. G.
Design for a three-fingered hand
N77-29761

USKOV, F. M.
Some psychoneurological requirements in in-flight evaluations of the functional state of cosmonauts
A77-41069

V

VAN HOREEN, D.
Increment spectral sensitivities of the primate late receptor potential and b-wave
A77-42866

VARENTSOVA, M. M.
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795

VASILEV, P. V.
Psychopharmacology in aviation and astronautics
A77-41064

VASILEVA, M. V.
The role of mineral surfaces in the origin of life
A77-43006

VASILEVA, T. D.
Characterization of regional circulation and vasomotor regulation after a two-month space flight
A77-41066

VESTERS, M. D.
Total body water and lean body mass estimated by ethanol dilution
A77-41813

VERSYLEN, J.
Turnover of fibrinogen, plasminogen, and prothrombin during exercise in man
A77-41816

VERSCHUUR, R.
Validity and reliability of pedometers in habitual activity research
A77-40664

VIRSU, V.
Long-lasting afterimages caused by neural adaptation
A77-42871

VOGEL, F.
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 1: Study report
[ESA-CR(P)-943-VOL-1] N77-29730
Study on incubators and holding units for cells and tissues, plants and low vertebrates. Volume 2: Drawings
[ESA-CR(P)-943-VOL-2] N77-29731

VOKONAS, P. S.
Autoradiographic measurement of regional blood flow in normal and ischemic myocardium
A77-42184

VUKOBRATOVIC, M.
New control concept of anthropomorphic manipulators
N77-29787

W

WADDELL, J.
Thermal data from helicopters operating in a sub-arctic environment
A77-42140

WAGNER, J. A.
Thermoregulatory responses during competitive marathon running
A77-41819

WAGNER, P. D.
Limits on Va/Q distributions from analysis of experimental inert gas elimination
A77-41817

WANG, S. C.
Fastigial nucleus and orthostatic reflex in cat and monkey
A77-42186

WARNER, D. S.
Dividing attention between auditory and visual perception
A77-40693

WASSERMAN, D. E.
Human performance and transmissibility under sinusoidal and mixed vertical vibration
A77-41456

WATANABE, T.
Echocardiographic measurement of right ventricular wall thickness - A new application of subxiphoid echocardiography
A77-42397

WEBER, K. T.
Ejection pressure and the diastolic left ventricular pressure-volume relation
A77-42182

WEISFELDT, M. L.
Echocardiographic assessment of a normal adult aging population
A77-42396

WEISS, A. K.
Development of SHR hypertension and cardiac hypertrophy during prolonged beta blockade
A77-42185

WEISS, Y. A.
Baroreflex sensitivity and cardiopulmonary blood volume in normotensive and hypertensive patients
A77-42413

WELLS, H. B.
A preliminary investigation of the Environmental Control and Life Support Subsystem (EC/LSS) for the space construction base manufacturing modules [NASA-TM-78123]
N77-29788

WELTMAN, G.
Control automation in undersea manipulation systems
N77-29776

WENDT-GALLITELLI, M. F.
Pressure-volume relations, elastic modulus, and contractile behaviour of the hypertrophied left ventricle of rats with Goldblatt II hypertension
A77-42993

WHITNEY, D. E.
Information and control issues of adaptable, programmable assembly systems for manufacturing and teleoperator applications
A77-43643

Information and control issues of adaptable-programmable assembly systems for manufacturing and teleoperator applications
N77-29780

WIKER, G. A.
Voice controlled adaptive manipulator and mobility systems for the severely handicapped
N77-29784

WILLIAMS, A. R.
Development and validation of an equation for predicting the comprehensibility of textural material
[AD-A040755]
N77-29789

WILSON, H. R.
Hysteresis binocular grating perception - Contrast effects
A77-42870

WINGET, C.
Force feedback systems in undersea manipulator applications
N77-29775

WOODS, R. R.
Technology advancement of the electrochemical CO2 concentrating process
[NASA-CR-151995]
N77-28736

Y

YAKIMOVSKY, Y.
Interactive handling of TV and range data for remotely controlled systems
N77-29759

YAMADA, M.
Possible surface reactions on Mars - Implications for Viking biology results
A77-41639

YIN, F. C. P.
Echocardiographic assessment of a normal adult aging population
A77-42396

YOCHMOVITZ, M.
Protracted radiation-stressed primate performance
A77-42133

YOUNG, R. H. F.
Alga growth potential of waste water effluents in Hawaiian receiving waters
[PB-265172/7]
N77-28715

Z

ZAGER, P. G.
Effect of bedrest on circadian rhythms of plasma renin, aldosterone, and cortisol
A77-42139

ZAKHAROV, I. A.
Ultrasensitivity of Drosophila mutants to ionizing radiation
A77-40795

ZALESKY, P. J.
Oxygen regulator performance during decompression
[AD-A038415]
N77-29793

ZARET, B. L.
Diagnostic accuracy of noninvasive myocardial imaging for coronary artery disease - An electrocardiographic and angiographic correlation
A77-40671

ZARGARIAN, B. M.
Method of photoelectric nystagmography
A77-40738

ZAVALOVA, N. D.
Psychological aspects of spatial orientation problems in pilots
A77-40658

ZAWACKI, B. E.
Effect of evaporative surface cooling on thermographic assessment of burn depth
A77-42239

ZETTERGREN, D. G.
Left precordial isopotential mapping during supine exercise
A77-42394

ZOHMAN, L. R.
Exercise testing in the diagnosis of coronary heart disease - A perspective
A77-43723

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This bibliography lists 233 reports, articles, and other documents introduced into the NASA scientific and technical information system in October 1977.

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